MALHEUR NATIONAL WILDLIFE REFUGE

Princeton, Oregon

ANNUAL NARRATIVE REPORT

Calendar Year 1988

Submitted By: Forrest W. Cameron Date: 1/19/90
Refuge Manager

Concurrence: _____ Date: _____
Associate Manager, ID/OR/WA

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Refuges and Wildlife

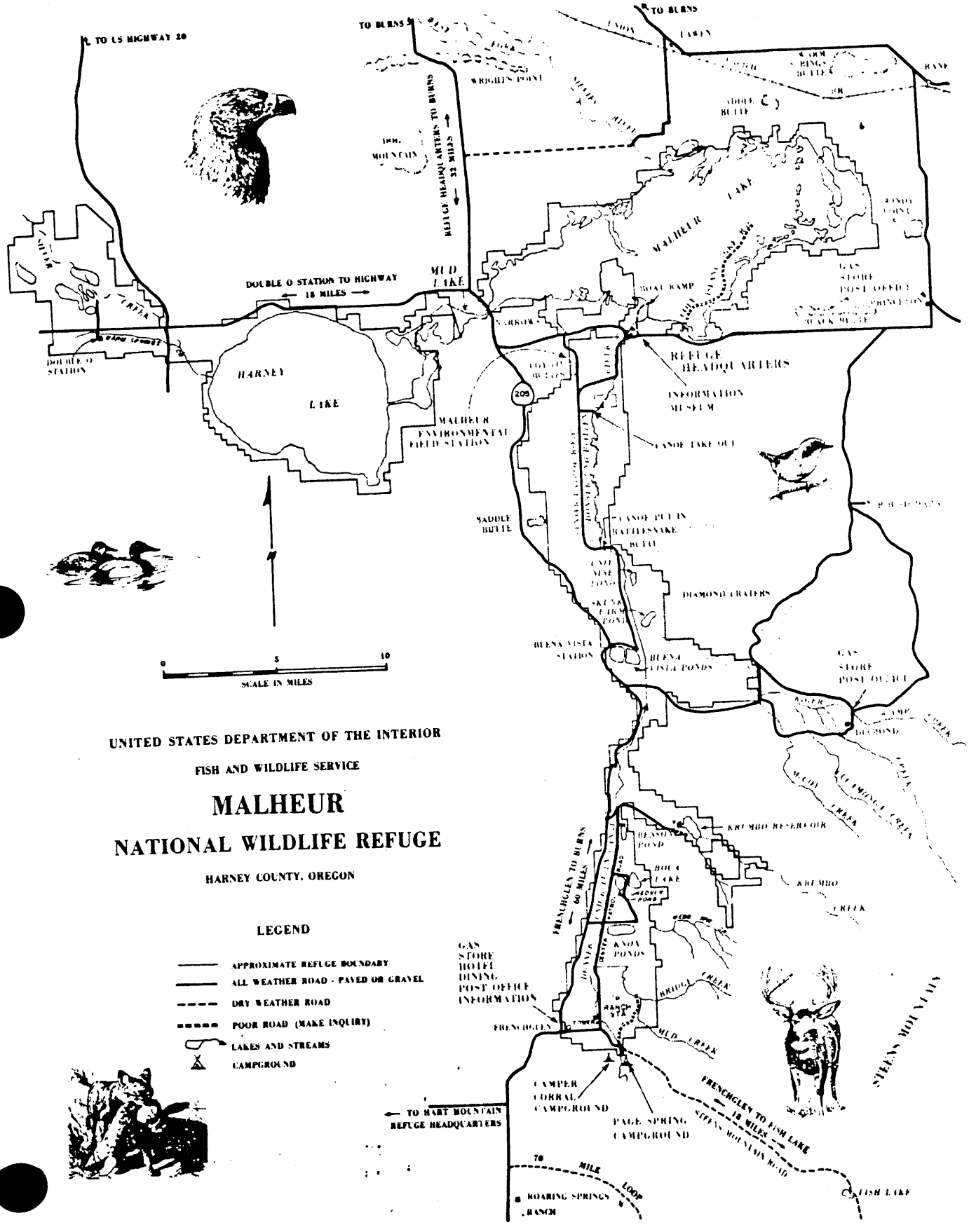
TO US HIGHWAY 20
TO BURNS
TO BURNS
WRIGHTS POINT
REFUGE HEADQUARTERS TO BURNS
32 MILES
SADDLE BUTTE
MALHEUR LAKE
DOUBLE O STATION TO HIGHWAY
18 MILES
DOUBLE O STATION
HARNEY LAKE
MALHEUR ENVIRONMENTAL FIELD STATION
BOAT RAMP
GAS
STORE
POST OFFICE
REFUGE HEADQUARTERS
INFORMATION
MUSEUM
CANOE TAKE OUT
CANOE PUT IN
RATTLESNAKE BUTTE
DIAMOND CRATERS
BUENA VISTA STATION
BUENA VISTA PONDS
GAS
STORE
POST OFFICE
DIAMOND
KRUMBO RESERVOIR
KRUMBO CREEK
FRENCHGLEN TO BURNS
60 MILES
BOCA LAKE
KNOX PONDS
GAS
STORE
HOTEL
DINING
POST OFFICE
INFORMATION
FRENCHGLEN
RANCH SITE
CAMPER
CORRAL
CAMPGROUND
PAGE SPRING
CAMPGROUND
TO HART MOUNTAIN
REFUGE HEADQUARTERS
FRENCHGLEN TO FISH LAKE
18 MILES
STEENS MOUNTAIN ROAD
70 MILE LOOP
ROARING SPRINGS RANCH
FISH LAKE
STEENS MOUNTAIN
0 5 10
SCALE IN MILES
UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
MALHEUR
NATIONAL WILDLIFE REFUGE
HARNEY COUNTY, OREGON
LEGEND
APPROXIMATE REFUGE BOUNDARY
ALL WEATHER ROAD - PAVED OR GRAVEL
DRY WEATHER ROAD
POOR ROAD (MAKE INQUIRY)
LAKES AND STREAMS
CAMPGROUND

Figure 3.

INTRODUCTION

General

Malheur National Wildlife Refuge (Malheur Refuge) is located in the Great Basin Region of southeastern Oregon. Shaped like a lopsided "T", the refuge spans an area 40 air miles long and 39 miles wide. Containing 185,540 acres, it is one of the largest of the over 450 units within the National Wildlife Refuge System. Refuge headquarters, on the south side of Malheur Lake, is 32 miles southeast of Burns - the nearest town. Elevation at headquarters is 4,100 feet above sea level.

The refuge was established primarily as production and maintenance habitat for migratory water birds by Executive Order of President Theodore Roosevelt in 1908. The 60,000-acre Blitzen Valley portion of the refuge was added in 1935, and the last large segment, the Double-O Unit, was purchased in 1941.

The refuge's basic habitat types are summarized in Table I, below.

Table I Habitat types and acreages on Malheur Refuge.

TYPE	ACRES
Grass/Shrub Uplands.....	63,380
Marshes.....	60,310
Alkali Dry Lake Beds.....	32,170
Meadows.....	25,600
Croplands.....	2,500
Riparian.....	800
Admin. sites/roads.....	780
	185,540

Regional Setting

Since prehistoric time, the Malheur-Harney Lake Basin has been an important nesting and migration area for migratory birds - especially waterfowl, raptors, and marsh birds. Together, the refuge and the Silvies River floodplain are one of the most important migration and production areas in the Pacific Flyway.

Major Pacific Flyway concentrations of snow and Ross' geese, northern pintails, bald eagles, long-billed curlews and other shorebirds, and lesser sandhill cranes concentrate in the basin during the spring migration. Concentrations of lesser sandhill cranes occur mainly on the Silvies River floodplain.

Early spring waterfowl use is concentrated on the open water areas (Double-O, Harney Lake, East Malheur Lake, and the floodplain between Burns and Crane). As more open water becomes available, the birds disperse to all suitable habitat within the basin. During a study conducted from 1975-78, 54 percent of the spring waterfowl use occured on the private floodplain and 46 percent on the refuge.

The fall migration routes are similar to spring routes. The major exception is lesser sandhill cranes. They shift their route to the west, passing on the west edge of the basin, then head southwest between Iron and Wagontire Mountains. The usual lack of water on the floodplain during this period causes use by waterfowl to shift dramatically to the refuge. While the recent flood cycle has reduced the attractiveness of Malheur Lake to waterfowl, the refuge still serves as a major Pacific Flyway stopover for tundra and trumpeter swans, ducks and geese (especially redheads, canvasbacks, and Canada geese), shorebirds, and colonial nesting birds use.

Prior to the recent flooding, Malheur Lake was used by 15 to 35 percent of the Pacific Flyway's canvasback population. Of those birds that winter in San Francisco Bay, over 35 percent have been seen on Malheur Lake at one time. Now that the marsh has been greatly degraded by flood waters and high carp populations, canvasback use has greatly declined.

Malheur Refuge represents a major production area in the Pacific Flyway. Malheur Lake, which is the heart of the refuge, is in actuality a shallow fresh water marsh, the largest in western North America. This marsh is especially important to diving ducks (redheads, canvasbacks, and ruddy ducks), colonial nesters (eared and western grebes, white pelicans, double-crested cormorants, great blue herons, great egrets, snowy egrets, black-crowned night-herons and white-faced ibis), and associated marsh and shorebirds.

The concentrations of waterfowl and waterbirds also attract bald eagles and peregrine falcons.

The refuge plays an important role in production of other species such as golden eagles, northern harriers, snowy plovers, American avocets, killdeer, greater sandhill cranes, American coots, cliff swallows, long-billed curlews, white-faced ibises, Franklin's gulls, bobolinks, loggerhead shrikes, common yellow-throats, yellow warblers, willow flycatchers and Brewer's sparrows.

Impacts of The Great 1980's Flooding

Record snowfall and unusually cool summers, from 1980 through 1986, resulted in record flows down the Silvies River, Blitzen River, and Silver Creek drainages. This caused significant damage to water management facilities in the Blitzen and Double-O Units and raised the level of the Malheur-Mud-Harney Lakes system to record levels. As of July 1985, the lake reached 4102.8' MSL. The once-famous Malheur Marsh was converted to open water. An estimated $4.5 M will be required to rehabilitate damaged facilities

Concurrent with the rising lake levels, populations of carp exploded in Malheur Lake, greatly diminishing the quality of the marsh for waterfowl. Waterfowl use and production on the lakes has drastically declined. The only waterfowl species which fared well on the lakes, since the flood, is the Canada Goose, which adapted to nest on the newly formed islands. Some islands support over 50 goose nests and the birds are almost "colonial".

The impacts of flooding on wildlife fall into three basic categories. First, the species that depend on a large amount of marsh nesting habitat (swans, rails and marsh birds), meadows (greater sandhill cranes) or alkali playa (snowy plover) were greatly impacted and the number of these species nesting in the lake units dropped to nil.

Second, the colonial-nesting birds proved very adaptable. Their numbers skyrocketed. White pelicans found the small isolated islands and in 1985 began nesting on the refuge. By 1988, over 900 pelicans were being produced annually. Egrets, herons and ibis relocated to the south on and off the refuge in smaller, scattered colonies and their numbers also increased (see the Annual Narrative Reports 1985 - 1987).

Third, our ability to provide good habitat conditions for key nesting species of the Blitzen Valley and Double-O units was affected by flood damage to the water management systems. Our maintenance staff has been able to keep the pieces together, but by year's end approximately 60% of the 90,000 acre units are not manageable wetlands.

The lakes began to decline in 1986, providing extensive mudflat habitats around their perimeters. Sparse vegetation, consisting primarily of annual forbs, has shown up on the drying flats. No emergent vegetation has reappeared to date and the lakes remain generally unproductive for waterfowl (except geese). The sand ridge closed the channel between Mud and Harney Lakes in 1988, separating the two systems' surface connection. Harney Lake has a sandy substate cleared, while Malheur and Mud Lakes remain turbid. All three lakes continue to support high populations of carp.

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INTRODUCTION

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PUBLIC USE (Cont.)

I. EQUIPMENT AND FACILITIES

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L. INFORMATION PACKET (inside back cover)

A. HIGHLIGHTS

-- The regional weather cycle flipped to a drought scenario and we were able to experience both flooding and drought conditions at the same time (Section B, "Climatic Conditions", page 2).

-- Twenty-four flooded ranchers expressed interest in trading or selling their lands to the refuge (Section C, "Land Acquisition", page 5).

-- A collared Malheur Refuge trumpeter swan was observed on January 12, 1988 at Lake Almanor for the first positive California record of Malheur swans (Section G3, "Waterfowl", page 44).

-- A botulism outbreak compounded by "fish handler's disease" (erysipelas) killed over 1500 birds (Section G17, "Disease", page 63).

-- Refuge biologist and two archaeologists escape with their lives after airboat sinks in Malheur Lake (Section E6, "Safety", page 22).

-- American white pelicans abandon nesting colony after "arrowhead hunters" tresspass onto closed islands. An estimated 835 fledglings died. (Section G4, "Marsh and Water Birds", page 53).

-- Ruth Warneke, Refuge Assistant, retires after 21 years of active federal service.

-- Acting Regional Director signs a "negotiated agreement" with local rancher during protracted contested water rights hearings by the Oregon Water Resources Department (Section F11, "Water Rights", page 41).

-- The first working group meeting on the Blitzen Valley Management Plan was held at the Malheur Field Station on March 18-20 (Section D3, "Public Participation", page 8).

-- The final report on "The Recommended Standard Grazing and Haying Rates for 1988 through 1991" at Malheur Refuge was completed, reviewed and signed off by concerned citizens and government agencies (Section J2, "Items of Interest", page 73).

B. CLIMATIC CONDITIONS

Drought conditions prevailed in the Harney Basin in 1988. The total annual precipitation recorded at refuge headquarters was only 5.875 inches. P-Ranch and Buena Vista substations fared slightly better with 7.85 and 7.67 inches, respectively. Precipitation was not recorded for the Double-O substation as no one was stationed there during most of the year. Continued warm temperatures through the month of October kept evaporation rates high and increased the effects of the drought. Table II summarizes monthly temperatures, precipitation, and lake levels recorded at refuge headquarters.

TABLE II Monthly high and low temperatures, precipitation, and Malheur Lake levels recorded at Malheur Refuge headquarters, 1988.

Month	Temperature (HQ) High	Low	Precipitation	Elevation of Malheur Lake The Last Day of the Month
Jan	47 F	-5 F	0.05"	4098.98' MSL
Feb	60 F	-3 F	0.18"	4099.04' MSL
Mar	68 F	9 F	0.05"	4098.96' MSL
April	73 F	9 F	1.23"	4098.64' MSL
May	90 F	19 F	0.73"	4098.54' MSL
June	94 F	37 F	1.085"	4098.08' MSL
July	91 F	36 F	0.00"	4097.74' MSL
August	91 F	41 F	0.20"	4097.44' MSL
Sept	90 F	28 F	0.23"	4097.35' MSL
Oct	83 F	25 F	0.00	4097.32' MSL
Nov	68 F	16 F	1.84"	4097.53' MSL
Dec	48 F	13 F	0.28"	4097.30' MSL
TOTAL:			5.875"	

Snow packs, the major surface water source for the region, were meager this year. The USDA Soil Conservation Service estimated that the Steen's Mountain snowpacks (which feed the Blitzen Valley) were 70-85% of average as of April 1, 1988. Poor runoff made irrigation and pond maintenance difficult on the refuge. The north section of Double-O, which is fed by Silver Creek, remained dry. Many of the ponds in the Blitzen Valley were dry by summer's end. This lack of late season brood water reduced waterfowl production on the refuge.

Malheur Lake's floodwaters continued to recede during the long, warm summer. By November 18 the lake's elevation had dropped to 4097.28' MSL, a level not recorded since before the flood cycle began in 1982. County road crews were finally able to remove flood debris and repair Sodhouse Lane, making refuge headquarters 4 miles closer to town. Table III shows peak and low lake level readings for 1982-88.

Floodwaters at Refuge Headquarters continued to recede during the summer of 1988.

County road crews repaired Sodhouse Lane after floodwaters receded.

Table III Annual peak and low elevations of Malheur Lake, 1982-88.

Year	Peak/Low	Date	Elevation
1982	PEAK	JUNE 1	4095.85' MSL
	LOW	OCT 25	4093.47' MSL
1983	PEAK	JUNE 30	4098.80' MSL
	LOW	NOV 1	4097.80' MSL
1984	PEAK	JUNE 25	4102.42' MSL
	LOW	OCT 9	4101.38' MSL
1985	PEAK	APR 23	4102.68' MSL*
	LOW	OCT 31	4100.62' MSL
1986	PEAK	MAY 11	4102.56' MSL
	LOW	NOV 12	4100.54' MSL
1987	PEAK	MAR 17	4100.92' MSL
	LOW	NOV 9	4098.56' MSL
1988	PEAK	MAR 8	4099.06' MSL
	LOW	NOV 18	4097.28' MSL

*Peak flood level

C. LAND ACQUISITION

3. Other

At the request of local flooded ranchers and U.S. Congressman Smith, the Service explored the potential for purchasing the ranchlands flooded by Malheur-Mud-Harney Lakes. We proposed several alternatives including fee purchase and exchanges based on a preset value per acre and land class. In effect, we proposed to pay from $50-75 per acre to purchase the land outright depending on the pre-flood land classification on record at the Harney County Assessor's Office. Wetland protection easements were approximately 16-20% of the fee purchase value. We determined there were very few, if any, opportunities for exchanges. All acquisitions would be on a willing-to-sell basis only.

On January 30, 1988, Congressman Smith, Refuge Manager George Constantino, Judge Dale White, and the flooded ranchers met at the county courthouse to discuss where the flooded lands "buy out" was headed. It was agreed that the Service would continue to support the effort and Congressman Smith would introduce a bill to authorize the sale, easement, and/or exchange of flooded land to the refuge, subject to eight stipulations. As of December 31, 1988 no bill had been introduced.

D. PLANNING

2. Management Plans

An Interim Plan for Cultural Resource Management was developed in September. The archaeological resources were identified, the threat of loss and/or damage was documented, and six steps were agreed upon to protect the cultural resources. These steps included:

1) securing funding
2) site reconnaissance and evaluation
3) formal inventory and curation
4) increasing local/state/federal law enforcement and public education on archaeological values
5) developing a "Human Remains Agreement" with the Burns Paiute Tribe
6) writing a formal management plan.

Contract Archaeologists excavate exposed Paiute burial sites on Malheur Lake

Archaeologists collect and document artifacts on Malheur Lake

A sampling of some of the artifacts that occur in profusion on the refuge

The first draft of the Blitzen Valley Management Plan was written and reviewed by members of the Blitzen Valley committee (see Section D3). The plan's purpose is to identify management strategies that will enhance the 65,000 acre Blitzen Valley and allow the refuge to meet the wildlife production objectives established in the refuge Master Plan. Four major factors have been addressed in this plan:

1. Water

   The refuge water system is 50 years old, badly deteriorated, and was severely damaged during the floods of 1982-85. Additional ponds need to be constructed, irrigation schedules should be changed, and water rights issues need to be addressed.

2. Carp

   A major carp control program needs to be implemented.

3. Vegetation

   Grazing changes are needed to protect uplands and riparian areas. Marsh areas need to be treated to provide more open conditions.

4. Predation

In order to meet the production goals of the Master Plan, predation must be kept at or below 60 percent for waterfowl and 25 percent for sandhill cranes.

The plan addresses the biological needs of 7 "key species" (greater sandhill crane, trumpeter swan, redhead, mallard, gadwall, cinnamon teal, and willow flycatcher) and uses the "habitat complex" concept to address management.

3. Public Participation

The refuge staff continued to develop the concepts, theories and data analysis needed to put the Blitzen Valley Management Plan together. This included the development of a public planning committee. The Blitzen Valley Management Planning Committee consisted of 41 people from a wide range of interests. This group met for the first time March 18-20 at the Malheur Field Station.

Committee representatives present at the March meeting included: local permitees (3), The Audubon Society (2), Burns Times Herald (1), Harney County Cattlewoman (4), National Wildlife Federation (1), Oregon Deptartment of Wildlife (1), Malheur Field Station (2), Ducks Unlimited (1), Oregon Trout (1), The Nature Conservancy (1), Harney County Court (1), Eastern Oregon Agriculture Research Center (1), Interested Citizens (5). In addition, refuge staff and several other Service employees were involved, including Dr. Arnie Kruse, Northern Prairie Wildlife Research Center; Dr. Jim Sedgewick, National Ecology Research Center; and Sanford Wilbur, ARW, Associate Manager ID/OR/WA.

The purpose for organizing the committee was to "...identify issues and concerns to be addressed during development of the Blitzen Valley Management Plan." This three day session involved a variety of techniques which are designed to provide a non-confrontational setting from which issues could be addressed. Side-boards were established at the beginning which emphasized that all issues must be directed at helping to solve the biological problems in the Blitzen Valley to allow the refuge to better meet the refuge mission. The workshop was considered very successful.

One of the exercises of the March workshop involved a field trip to the south end of the Blitzen Valley to provide "on the ground" evaluation of habitat management concerns. In this photo (left to right) Larry Hammond, Maurita Smythe, John Bourneman, Sanford Wilbur, and Dick Ingram discuss the management of the West Big Juniper Field.

On June 2, a second Blitzen Valley Management Plan field session was held to allow members of the committee to evaluate changes in vegetation conditions as the growing season progresses. One day was spent in the South Meadow Field evaluating habitat conditions and wildlife needs.

Throughout the year, Refuge Manager Constantino met with the Grazing Fee Review Committee. The Committee is working on a report, to be completed in 1988, that will outline recommendations for a new grazing fee-setting process for the refuge.

Assistant Manager Johnson and Refuge Biologist Paullin served on a committee for the Lakeview District Office of the BLM. The committee was organized to provide input for a BLM proposal to acquire private lands in the Warner Valley. The Warner Valley potholes are an important wetland complex northeast of Lakeview, Oregon. Johnson and Paullin served on the committee as "experts" on how the lands should be managed to "optimize" wildlife benefits. Private land owners expressed concern over the changes that would be implemented to meet wildlife needs. There was some reluctance by the landowners to sell these lands to the federal government, but the group overwhelmingly supported the concept that the lands have outstanding wildlife

values and should be managed in a manner that best benefits wildlife. To date, the acquisitions have not been finalized. Alternatives being considered include exchanges for BLM land and the Nature Conservancy involvement. The outlook is promising that these lands will soon be managed by the BLM as their "first" wildlife production area.

In October, a Local Citizen Handicap Access Committee was established to help the refuge staff prepare the required Section 504 Handicap Access Plan. The group gave us a good idea of the basic changes needed to help the handicapped visitors enjoy the refuge. More ramps, signs, and handicap-accessible restrooms are planned to make it easier for everyone to visit and use the refuge.

Volunteer Cecil Gagnon constructs handicap access facilities at refuge head quarters.

The Army Corps of Engineers (Corps) completed their evaluation of possible actions to help Harney County withstand the flooding of Malheur and Harney Lakes. They recommended no action and found the alternative to draw down the lakes too expensive - environmentally and economically. The railroad relocation had a positive benefit/cost ratio but national policy prevented the Corps from funding a project to help a single owner, non-public organization such as the Union Pacific Railroad. Local, state, and federal officials disagreed with this finding and vowed to get the Corps to change their minds about the railroad.

4. Compliance with Environmental Mandates

A Section 404 permit was issued to the refuge by the Army Corps of Engineers to allow the placing of juniper riprap and rock stream deflectors into the Blitzen River below the Page Springs Dam. Five years of heavy flooding and many years of intensive livestock grazing had taken its toll on the streamside environment. Livestock grazing has been excluded from the riverbanks for eight years but recovery has been slow. In cooperation with the Soil Conservation Service, Oregon Department of Fish and Wildlife, BLM, Trout Unlimited, and Oregon Flycaster's Association, a three to five year rehabilitation program driven by volunteers and state and federal resource agency personnel is anticipated to promote the speedy recovery of riparian zone and trout fishing along the Blitzen River.

Volunteers and refugees position trees along a section of the Blitzen River to create a section of "juniper riprap".

Workers pose with their finished product

5. Research and Investigations

Malheur NR 81 - "Color-marking of Greater Sandhill Cranes on Malheur Refuge, Oregon" - MLH-30.

The objectives and justification for this study include color marking greater sandhill cranes which nest and stage at Malheur Refuge, to document effects of land use practices on cranes breeding at Malheur, and to identify birds from other flocks which stage at Malheur Refuge during spring and fall migration. No cranes were marked in 1988 due to an unusually early fall migration of cranes out of the refuge. To date, over 350 cranes have been marked, providing valuable long-term data on crane ecology. C.D. Littlefield is conducting this research.

Malheur NR 85 - "Effect of Early-Spring Burning on Greater Sandhill Cranes (Grus Canadensis tabida) at Malheur Refuge, Oregon" - MLH-34.

This study was initiated in 1985 by C.D. Littlefield. The primary objective is to determine how prescribed burning affects the overall nesting biology of sandhill cranes. The study is a long-term monitoring effort aimed at elevating prescribed burning as a possible tool to help the refuge reach sandhill crane production objectives. Data collection continues and no results or conclusions are available at this time.

Malheur NR 86 - "Study of Population Trends of Small Mammals on Malheur Refuge, Oregon" - MLH-33.

This study was initiated in 1986 by Dr. David Kerley of Eastern Oregon State College at La Grande. The purpose is to monitor long-term trends in small mammal populations in two Great Basin shrub communities (sagebrush and greasewood).

Dr. Kerley submitted a progress report summarizing his 1988 data and compared them to his earlier findings. Key points in his summary were:

1. The population of montane voles on each site continued to decline from its peak in 1986.

2. The chipmunk population seems to have reached a peak and may be stabilizing from a measured low in 1986.

3. The kangaroo rat population on the sagebrush grid continued to show a gain from a low in 1986.

4. The pocket and deer mouse populations seem to have reached the holding capacity of both grids.

5. The harvest mouse population increased on both grids.

Malheur NR 86 - "Response of Salix exigua to prescribed burning" - MLH-35.

This study was initiated in 1986 by Dr. Fritz Knopf, Service's National Ecology Center, Ft. Collins, Colorado. The objectives and justification are outlined in the 1986 Narrative Report. The study is on-going and to date showed very little change in willow growth from 1987. Numerous willows were killed outright by the fire and the response to fire (in terms of increased suckering and greater current annual growth) of those willows which survived was minimal. A final assessment will be made in 1990 (3 years post burn). Tentatively, fire does not appear to stimulate willow regeneration or growth a Malheur Refuge.

Malheur NR 87 - "effects of prescribed burning of islands on Canada Goose nesting." - MLH-36.

Assistant Refuge Biologist Gary Ivey initiated this study in 1987 to monitor the effects of burns on goose nesting islands. Based on data collected in 1987 and 1988, it appears that geese are attracted to islands with sparse cover (burned islands); however, homing to past nest locations may be more important in nest site selection than cover.

Malheur NR-87 - "Effects of selective mowing of meadow habitats on breeding pairs and nest densities of ground-nesting birds". - MLH-37.

Refuge Biologist David Paullin initiated this study in 1987. In spring of 1987, meadow habitat was mowed experimentally to determine if mowing could be used to selectively create habitat diversity within large blocks of meadows to enhance duck nesting. The data suggested that the control plots supported higher duck nest densities; however, sample sizes were too low to draw definite conclusions. This technique needs to be more thoroughly evaluated to determine its merits.

Malheur NR-87 - "Environmental contaminants and reproductive success of waterfowl, stilts, and coots at Malheur Refuge". - MLH-38.

This study was initiated by Dr. Charles Henny, of Patuxent Wildlife Research Center, Pacific Northwest Field Station, to investigate levels of contaminants in eggs of selected wetland species, and to determine if contaminants were impacting production in these species. No results on the study have been received to date.

Malheur NR-88 - "Assessment of fish migration in the lower Blitzen River". - MLH-39.

This study was initiated by Oregon Department of Fish & Wildlife to determine the timing and magnitude of movements of native redband trout in the lower Blitzen River and East Canal, and also to assess

1988 results were as follows:

1. No trout were trapped at Sodhouse Dam.

2. Grain Camp Dam accounted for 86% of all trout trapped. Six fish which were trapped at Grain Camp were caught by fishermen below Page Springs Dam.

3. At Page Springs Dam, 80% of the fish trapped were ready to spawn. One fish tagged at Page Springs was caught at the gauging station approximately 2 miles above the dam.

Malheur NR 88 - "Effects of land use on duck pair use at Malheur Refuge". - MLH-40.

Assistant Refuge Biologist Gary Ivey initiated this study in 1988 to measure duck pair use on paired plots under different land use regimes. Preliminary results indicate that duck pairs select the most intensively treated areas (e.g. burned, heavy grazing) early in the breeding season and apparently shift to areas of less intense treatments later.

Malheur NR 88 - "Willow flycatcher reproductive success, population dynamics, and habitat relationships". MLH-41.

Jim Sedgwick of the National Ecology Research Center initiated this study in 1988. The study is designed to examine the extent and causes of variation in reproductive success, and the survival, productivity, and habitat relationships of a healthy population of willow flycatchers at Malheur Refuge. Site tenacity, as related to reproductive success and habitat quality, predation, parasitism by brown-headed cowbirds, and environmental (habitat) correlates of reproductive success will receive special attention.

The first year (1988) of data collection was considered to be a pilot year for the project. Cowbird parasitism was surprisingly low (5%). The highest densities of willow flycatchers were found in willow stringers along the channelized Blitzen River and the Center Patrol Road.

E. ADMINISTRATION

1. Personnel

(from left to right)

Top Row: 5,13,17,1,25,18,14,16,15
Bottom Row: 9,7,19,3,8,2

1.	George M. Constantino, GM-13, PFT.....	Refuge Manager
2.	Richard W. Voss, GS-11, PFT.....	Asst. Refuge Manager
3.	David N. Johnson, GS-11, PFT.....	Asst. Refuge Manager
4.	David O. Paullin, GS-11, PFT.....	Wildlife Biologist
5.	Gary L. Ivey, GS-9, PFT.....	Asst. Wildlife Biologist
6.	Sharon A. Freshman, GS-7, PFT.....	Refuge Manager Trainee
7.	W. Ruth Warneke, GS-5, PFT (Ret 9/30/88).	Refuge Assistant
8.	Arlene Miller, GS-5, PFT.....	Secretary
	GS-6, PFT Promoted 9/23/88	Refuge Assistant
9.	Joanne Vawter, GS-3, PPT (Resign 6/18/88)	Clerk-Typist
10.	Connie Dellera, GS-1, TFT (EOD 8/1/88) (Resign 12/2/88)	Clerk

12.	Mary Jo Piatt, GS-3, PFT (EOD 12/27/88)..	Clerk-Typist
13.	Marvin L. Jess, WG-10, PFT.....	Crane Operator
14.	Clyde R. Miller, WG-9, PFT.....	Maintenance Mechanic
15.	Thomas E. Downs, WG-9, PFT.....	Eng. Equipment Operator
16.	Blake G. Nuffer, WG-9, PFT (EOD 1/17/88).	Maintenance Mechanic
17.	David L. Bronson, WG-8, PFT (EOD 7/03/88) (Resign 7/29/88)	Maintenance Worker
18.	Bruce F. Aldrich, WG7, TFT.....	Maintenance Worker
	PFT (EOD 9/25/88).	Eng. Equipment Operator
19.	Michael I. Rule, GS-5, TFT.....	Biological Technician
20.	Steve Shaw , GS-4, TFT 06/15-08/27/88	Range Technician (Fire)
21.	Michelle Busse, GS-4, TFT..... 06/15-09/15/88	Range Technician (Fire)
22.	Dave Williamson, GS-5,TFT..... 06/15-09/05/88	Range Technician (Fire)
23.	Brett Hodgsen, GS-5, TFT 04/05-06/15/88	Biological Technician
24.	Marcy Hayworth, GS-5, TFT..... 05/04-06/15/88	Biological Technician
	06/16-10/07/88 GS-4, TFT.....	Range Technician (Fire)
25.	Perry Watson, APHIS	

Refuge Assistant Ruth Warneke retired September 30 after 21 years of Federal service.

Table IV Personnel management at Malheur Refuge, 1982-88.

FISCAL YEAR	PERMANENT FULL-TIME	PERMANENT PART-TIME	TEMPORARY
1982	12		4
1983	12		10
1984	12		6
1985	13	1	5
1986	13	1	7
1987	14	1	6
1988	14	1	8

Marvin Jess receives recognition for 30 years of dedicated Federal service.

Dave Johnson and Mike Rule Receive a Special Achievement Award for developing the refuge Geographical Information System for $5,000 instead of $25,000!!

2. Youth Programs

Applications for the Youth Conservation Corps (YCC) camp, which was in session from June 13 through August 8, were solicited from students of Burns Union High School and Crane High School. Thirty-six youths applied, from which three girls and three boys were randomly selected. Stan Keefer, a teacher at Slater Elementary, who was new to the program this year, was hired by the refuge.

Of the six enrollees, all but one completed the eight week summer job. After the first week, one enrollee quit and another was hired in her place. For the remaining seven weeks the enrollees proved to be capable workers with a great deal of initiative. Few problems developed over the eight week period and none were of a serious nature.

There was one enrollee who showed exceptional leadership, hard work, and a desire to learn more about his job and the refuge. Morgan Boatman was promoted to youth leader after four weeks. There were two enrollees that had poor work habits, but as the weeks passed, they proved to be capable workers and could be depended upon to fulfill any work assignment given them. There were some "grumblings" throughout their tenure, but with reflection, they will see the value in the skills they have learned and good habits formed.

The crew met at Burns Union High School and travelled daily to the various worksites scattered throughout the refuge. The time spent driving to the worksite averaged forty-five minutes. The vehicle was furnished by the refuge.

The YCC crew was involved in a variety of projects. The first two weeks were spent doing maintenance around the headquarters area. The following is a list of the projects:

1. Painting interior and exterior buildings
2. Inventoruing surplus equipment
3. Duck nest searching
4. Fencing at Double O, Dunes, Frenchglen, Witzel Corral, Headquarters Road
5. Trimming willows on the CPR and at Page Springs Campground
6. Catching and banding willow flycatchers
7. Maintenance work at Double O
8. Maintenance work at P Ranch
9. Spreading gravel at duck banding sites
10. Community service projects:
    - Sod House
    - Frenchglen (building fence)
    - Burns Union High School
11. Porcupine protection (tree banding)
12. Fence repair at Witzel corral
13. Removing old fence at North Juniper and Knox #3 Fields.

The 1988 YCC crew from left to right: Morgan Boatman, Seth Jordan, John Mims, Erica Farstvedt, Jennifer Glerup, Cathy Taylor and Stan Keefer (crew leader)

Several times during the summer, the youth were involved in environmental education. The goal was to involve the enrollees in some sort of environmental education each week. The crew members were involved in bird identification, plant identification, helping with the willow flycatcher research project, duck banding, and sexing of ducks. Refuge Manager Constantino gave the enrollees a presentation on refuge management and its goals and objectives.

During the first week of work, the YCC crew and its crew leader were given an eight hour first-aid course and an eight hour CPR course taught by the local ambulance crew. Hazards that enrollees might encounter were pointed out by an employee of the refuge.

During the second week of work, the Assitant Refuge Biologist Ivey took the crew into the field to search for duck nests. Selected plots are established by the biologists. The nesting birds are counted to help determine their numbers and establish statistics on pre-hatch mortality. Biologist Ivey identified and described various birds for the enrollees and answered questions concerning the project and the birds sighted.

There were two injuries that required medical attention. One of the enrollees was struck by a rock while building a duck banding site, and the crew leader was injured when a log fell on his foot. Neither accident caused time loss from work.

There were many factors that made this year's crew so successful. First of all, the crew was made up of young enthusiastic, intelligent, and responsible youth who came to "work". Also, the manner in which the refuge staff complimented the crew's work not only raised the YCC crew's self-esteem, but provided motivation for the crew to continue in a positive manner. The enrollees' experiences will benefit them in their future work situations. The education given to this year's crew members has not only increased their awareness of the environment outside of their community, but also sparked an interest in resource management as a potential career for at least one individual.

4. Volunteer Programs

Eighty people, including 37 high school students volunteered on the refuge this year and contributed a total of 3114 hours. Work included waterfowl banding, wildlife and habitat surveys, juniper riprap and willow placement to rehabilitate riparian zones, filing and typing, reference library cataloging, staffing the visitor center on weekends, landscaping and cleaning the office and museum visitor facilities, carpentry and posting work for improved handicapped access, general building maintenance, irrigation and surveillence of the vacant Double-O substation. Over 800 hours of volunteer effort was directed at video taping, designing displays, printing and copying handouts, graphs and charts for the working group review of the draft Blitzen Valley Management Plan.

Most volunteer work occurred between March 1 and October 30. Landscape and facility maintenance volunteers were scheduled one week per month. Wes and Faye Richards did their usual outstanding job ... for the fourth year in a row! Volunteers interested in biological experience worked for 2-6 week periods, as appropriate to their schedules and refuge needs. Rod Klus volunteered for the entire summer and completed wildlife survey work that would not have been done otherwise. Portland and Bend Audubon Society volunteers worked on weekends at the visitor center during spring and fall "peak" birdwatching seasons and also completed a high quality headquarter's landscape plan.

We concentrated on recruiting self-starting, goal-oriented people who had a definite "time" commitment in mind. This resulted in important projects being completed in a thorough manner, with a minimum amount of supervision. Most volunteers were pleased with how they spent their time and what they learned. The refuge completed many tasks that would not have been accomplished without volunteer help and time.

5. Funding

Table V Malheur Refuge Station Funds, 1984-88.

FUNDS SOURCE		FISCAL YEAR (FUNDS IN DOLLARS)				
		1984	1985	1986	1987	1988
1260	(MB)	569,500	602,300	572,000	630,800	643,000
	(YCC)	15,000	14,640	20,620	12,800	10,000
6860	(SALES)	21,000	21,000	21,000	21,000	30,000
1270	(ADC)	500	500	500	---	---
8610	(QTRS)	14,200	9,500	3,200	8,100	5,300
1240	(FIRE)	---	---	---	37,500	60,000
TOTAL:		620,200	647,940	618,920	710,200	748,300

6. SAFETY

Station safety meetings were held in conjunction with the monthly full-staff meetings. The station safety chairman for the year was Richard Voss. Committee members were Arlene Miller, Gary Ivey, and Blake Nuffer. Major projects for the committee included investigation, discussion, and reporting of the airboat sinking in Malheur Lake, the P-Ranch pumphouse fire and conducting the annual station safety inspection. Continuing safety meeting discussions included: all-terrain vehicle training, airboat training, vehicle inspections, fire extinguisher inspection, and safety training. New topics for discussion included: Heat stress, soft body ticks (Lyme's disease), cold water drowning, general health and stress control, seat belts and costs of accidents, hazardous material disposal, freezing weather driving tips, fire safety for buildings and poor station safety record.

During the second week in June, a multimedia first-aid and CPR training course was given to YCC enrollees, fire crew, and interested refuge personnel.

BLM fire coordinators and their Frenchglen crew chief joined refuge personnel for the annual "fire training week". Fire safety films, pumper operation training sessions, step tests, and fire shelter deployment courses were completed.

On the evening of March 4, the P-Ranch pump house was totally consumed by fire despite valiant efforts of Substation Blake Nuffer to put the fire out. Investigation by the Burns Fire Chief, Chris Briels, indicated that arc balling on the end of heat tape wire used around water pipe caused electrical overheating. The wood box built around the pipe ignited and flames spread to the pumphouse.

P-Ranch pump house fire remains

On May 6, 1988, at 9:15 a.m., biologist Dave Paullin and archaeologists Lucille Housely and Mel Aikins were in a 1988 Panther Airboat on Malheur Lake en route to archaeological sites on refuge islands. The water conditions looked "reasonable" when they left refuge headquarters that morning. While on the lake a strong wind storm created large breaking waves that made the flat-bottomed airboat nearly impossible to handle. The boat filled with water as Dave attempted to steer the boat to the lee side of an island for shelter. The boat sank in 12 feet of water.

All three people were able to stand on the highest portion of the completely submerged craft. Paullin was able to radio refuge headquarters for help with a hand held radio. After a community rescue effort involving a private aircraft, Oregon State Police, Burns Fire Department, Oregon Department of Fish and Wildlife, BLM and Service personnel, all three people were successfully rescued after 1 1/2 hrs in 55° F water. They were transported by ambulance and Airlife helicopter to Burns Hospital, treated for hypothermia and released.

All three "boaters" are alive and well ... and were out on the lake three weeks later locating and investigating archaeological sites.The airboat was retrieved from the lake at the end of summer. The hull can be reused but the engine was unsalvageable.

The sunken airboat was located and towed to dry land later in the summer.

After a full staff debriefing and critique and a safety committee review of the incident, three things that went "right" were identified and twelve corrective recommendations were implemented. We all agreed that the calm and determined rescue effort and a 110% dose of LUCK were necessary in this case for the successful outcome of a potentially tragic incident ... "chance favors the innovative mind!"

F. HABITAT MANAGEMENT

1. General

Spring runoff provided good early habitat conditions, but these quickly deteriorated as the summer progressed to droughty conditions. The Double-O section of the refuge was most seriously affected. Many fields in this area never received any water at all due to upstream diversions and poor runoff conditions. Some fields, such as Peterson, Rock Island, North Stinking Lake and Chappo Fields produced only 10% as much vegetative biomass as the previous year.

The Blitzen Valley portion of the refuge was impacted to a lesser degree, but late season brood water was very limited by late July. Brood ponds were maintained at the expense of irrigated meadow. This caused some problems for sandhill cranes with young colts.

The refuge staff continues to progress with the Blitzen Valley Management Plan. Many of the ideas and prescriptions for Biological Unit 12 have already been completed. Some of these changes include:

1. The East South Meadow and the West Juniper Fields were converted from a rake-bunch grazing program to hay-only to provide protection to willow riparian areas while providing treatment to meadow areas.

2. The Upper Bridge Creek, Mud Creek, and Big Poison Fields were put into idle status to promote improved riparian and big game winter cover conditions.

3. Fish screens were installed in the East and West Canal to prevent flushing of red-band trout into the meadows.

4. Rip-rap was placed along sections of the Blitzen River to improve willow habitat and fisheries habitat.

5. Willows were planted along upper Bridge Creek to encourage more rapid recovery of a deteriorated riparian zone.

Site specific monitoring transects were completed again this year in the Jones, South Meadow, Knox #4, Island, Dredger #2, Peterson and Yriarte Fields. These transects provide valuable information on vegetation conditions and recovery rates associated with different treatments. The information is summarized and stored in the respective field folder.

2. Wetlands

Malheur Lake continued to recede in 1988, after reaching a record peak elevation in 1985. By mid-November, lake levels lowered to an elevation of 4097.28 MSL, then slowly increased thereafter. This level is 5.40 feet below the record 1985 peak and 1.28 feet below the low for 1987. The lake was still about 7 feet higher than the "normal" levels experienced during much of this century.

Emergent vegetation remained absent from the lake. Extensive mudflats were exposed around the lake by late summer. Most of these flats were slowly invaded by annual forbs; however, baltic rush and annual grasses appeared at some sites.

In the Double-O Unit, major ponds in the north portion (Derrick Lake, Warbler Pond and Martha Lake) were filled from the springs during winter. Irrigation runoff water was not available in the northern part due to local drought conditions within the Silver Creek drainage and unauthorized upstream irrigation use. Beginning in April, the spring water was diverted to irrigate the southern half of the unit and water in the northern portion gradually declined. By the end of the summer, Derrick and Martha Lakes were very low and Warbler Pond dried up entirely. These areas were refilled with spring water in September and were maintained through the winter.

The Blitzen Valley also experienced a drier-than-normal year, water availability was inadequate to irrigate most units through early summer. This resulted in dry or very low water levels in most Blitzen Valley ponds by late July, causing a critical shortage of brood water in the area.

Aquatic plant surveys were conducted on most major refuge ponds in July and August. The overall quality ratings of the ponds were as follows: 8% excellent, 28% good, 12% fair, and 28% poor (24% were dry). Generally, quality ratings were lower on most ponds than in 1987. In 1987, 60% of the ponds were rated good or excellent, compared to 36% good or excellent in 1988. Reduced water supplies caused a general decline in habitat quality and lead to increased carp densities in many areas.

No formal aquatic plant survey was conducted on Malheur Lake in 1988 because of the high water, high turbidity, and apparent total lack of submergents. Aquatic plant survey data for refuge ponds is summarized in Table VI. Table VII summarizes estimates of aquatic plant acreages for the major refuge ponds and for the lakes.

Table VI Summary of aquatic plant survey data collected on ponds on Malheur Refuge, 1988.

UNIT	POND NAME	QUALITY RATING	AVERAGE CLARITY(cm)	DOMINANT VEGETATION	CARP INDEX
1	Martha Lake	poor	68	POPE/MYEX	2
1	Warbler Pond	dry	-	---------	-
1	Derrick Lake	poor	19	POPE	5
1	Dune Pond	dry	-	---------	-
1	Tule Pond	dry	-	---------	-
7	Pintail Pond	good	26	POPE	3
7	Wright's Pond	fair	24*	POPE	5
8	E. Buena Vista	good	46	URVU/POPE	2
8	W. Buena Vista	dry	-	---------	-
8	Unit 8 Pond	excellent	62	MYEX	2
9	Skunk Farm Pd.	dry	-	---------	-
9	Unit 9 Pond	excellent	19	POPE/MYEX	2
9	Diamond Swamp	dry	-	---------	2
10	Krumbo Swamp	good	23	MYEX	1
10	Witzel Pond	good	19	PONO	4
10	Crane Pond	poor	31	POPE	3
11	Boca Lake	poor	13*	---------	3
11	Benson Pond	fair	39	POPE/PONO	3
11	Dredger Pond	good	17*	POPE	4
11	Jones Pond	fair	34	POPE	4
12	Cottonwood Pond	good	65	POPE/URVU	1
12	Rail Pond	poor	44	POPE/PONE/CEDE	4
12	Knox Swamp	poor	7	URVU	1
12	E. Knox Pond	poor	13*	----------	2
12	Darnell Pond	good	0*	POPE	2

* Algal bloom restricting clarity.

POPE= Potamogeton pectinatus
PONO= Potamogeton nodosus
MYEX= Myriophyllum exalbescens
URVU= Utricularia vulgaris
CEDE= Ceratophyllum demersum

CARP INDEX:
1= No carp
2= Few carp
3= Moderate carp numbers
4= High carp numbers
5= Carp up to our elbows!

Table VII Estimated acreages of submergent plants in major ponds within each Biological Unit at Malheur Refuge, during aquatic plant surveys in 1988.

BIOLOGICAL UNIT	ACRES OF SUBMERGENTS
1	41
2	0
3	0
4-5-6	0
7	105
8	37
9	15
10	44
11	129
12	105
TOTAL	476

1988 Pond Management Actions:

Dry Ponds

Ponds in the northern portion of the Double-O, which remained dry all year (due to lack of irrigation water) include: Rock Island, Windmill, Avocet, Stilt, Shoveler, Green-wing, and Jewett Ponds. In Unit 7, Donner and Blitzen ponds remained dry. Lava Beds Pond in Unit 9 also remained dry.

Carp Control

Carp control was achieved via late summer drawdown in the following ponds: Warbler, Dune, Tule, Skunk Farm, Unit 9, Diamond Swamp, Rail Pond, Bridge Creek Pond, and East Knox Pond. Also, it is believed that carp were eliminated by freezing in the following ponds: Wright's Pond, Boca Lake, West Buena Vista Pond, and Knox Swamp.

Prescribed Burning

The following ponds were burned during late winter: Dredger, Unit 9 (islands), West Buena Vista (island), Boca Lake (island), and Cottonwood Pond (see Section F9). Islands in selected ponds were burned to evaluate the effects of island burning on goose nesting (see Section D5).

4. Croplands

Norman Ranches was issued the cooperative farming permit for the refuge again this year. They planted 680 acres of Cajuse oats and Belford beardless barley in five refuge fields: East Grain Camp, West Upper Grain Camp, Lava Beds, South Krumbo #1, and West Knox Pond Fields. Despite several requests by refuge staff, irrigation of the fields was not attempted until after the Blitzen River dropped into a late summer flow condition. As a result, not enough water could be maintained in canals and ditches to properly water the grain. The permittee decided there was not enough growth to "green chop" his share this year so the entire crop was left for wildlife. East Grain Camp and West Knox Pond Fields received heavy wildlife use during late spring and again in late fall as the fields were slowly flooded. Mule deer and Canada geese fed in the South Krumbo and West Upper Grain Camp Fields year round.

5. Grasslands

For the purposes of management at the refuge, grasslands are divided into two basic habitat types: uplands and meadows.

Uplands

Uplands are defined as those areas where basin wildrye, sagebrush and their associated species dominate the vegetative composition at ecological climax. These areas are managed for wildlife by providing periodic treatment to insure vigorous plant growth and residual nesting cover. The primary treatment involves prescribed burning on a 10 year frequency followed by non-use.

The habitat monitoring and classification program has made it possible to identify current and potential habitat conditions and to monitor trends in habitat condition for 23,300 acres of uplands in the Blitzen Valley. Results indicate that overall cover conditions have improved significantly in the uplands during the past 15-20 years. Uplands are providing cover at or near their potential in about 90% of the uplands in the Blitzen Valley. Implementation of the Blitzen Valley Management Plan should allow for improvement of an additional 3,988 acres of high potential uplands. Most improvements will be accomplished by eliminating annual grazing of uplands in the north Blitzen Valley.

Meadows

Meadows comprise the zone between the upland sites and emergent marshes where moist, seasonally flooded soils favor the production of rushes, sedges and water-tolerant plant species. A variety of treatments are conducted on the meadows (haying, grazing, idle and prescribed burning) to provide diverse conditions for wildlife. Treatment intensity is the primary factor used to monitor meadows. Treatment intensity is defined as the percentage of biomass removed or damaged in relation to pre-treatment conditions. The information gathered for meadows in the Blitzen Valley is expressed in Table VIII by type of use for the 1987-88 season.

Table VIII Treatment intensities and acreages for fields in the Blitzen Valley, Malheur Refuge.

TREATMENT INTENSITY	ACRES	PERCENT
Idle (no use)	8810	42.0
Graze Only (light use)	2529	12.0
Rake-Bunch Graze	7020	34.0
Hay Only	1537	08.0
Prescribed Burn	883	04.0
TOTAL for Blitzen Valley	20,779	100.0

(NOTE: The figures expressed in last year's narrative report reflected conditions in Biological Unit 12 only.)

6. Other Habitats

Woody riparian zones are managed to provide optimum conditions for a multitude of species including red-band trout, willow flycatchers and other songbirds. Management includes the efforts to protect these areas from disturbance and promote healing of areas previously disturbed.

The habitat monitoring program shows that riparian zones are currently in good condition and are improving in virtually all sections of the Blitzen Valley.

Sixth grade students from Slater Elementary School in Burns receive root stock and planting instructions for their riparian rehabilitation project on lower Bridge Creek

Bridge Creek continues to improve after the exclusion of livestock. Shrubs were planted along the creek in 1987 and more were planted this year. On April 28, 60 sixth grade students from Slater Elementary School spent about 4 hours planting shrubs along lower Bridge Creek, from the East Canal to the refuge boundary. Below is a list of what was planted.

SPECIES		# PLANTED
Coyote Willow	(Salix exigna)	300
Golden Willow	(S. lasiandra var. candata)	70
Sticky Currant	(Ribes cereum)	250
Redosier Dogwood	(Cornus stolonifera)	200
Quaking Aspen	(Populus tremuloides)	50
Hybrid Poplar	(P. tricocarpa)	25
Woods Rose	(Rosa woodsii)	250
Box Elder	(Acer negundo)	25

All of the plants were taken from original stock found in the P-Ranch area.

Willow riparian habitat along the upper section of the Blitzen River near Page Springs Campground was enhanced through the cooperative efforts of Trout Unlimited, Oregon Department of Fish and Wildlife, the YCC crew and refuge personnel. In August, crews placed juniper rip-rap along the banks, repaired old jetties, constructed new jetties, and planted willows.

This is the first of a series of joint ventures between the refuge and other agencies and private organizations to improve riparian habitat along the Blitzen River. Table IX lists this year's accomplishments.

Table IX Blitzen Valley juniper rip-rap projects completed in 1988.

PROJECT #	SITE #	# NEW JETTIES	# OLD JETTIES	JUNIPER RIP-RAP	WILLOW PLANTING
1	4	3			100 FT
1	5	1	2	120 FT	
1	6	7		120 FT	
2	2	2	1	80 FT	
3	13			40 FT	

7. Grazing

This was the 7th year of the Harney County Emergency Forage Program. Malheur Refuge has provided forage in the Blitzen Valley and Double-O Units since 1982 to help offset the impacts of the flood. This year, the board established to govern this program was disbanded. It was decided that no new permits would be approved and the permits currently issued would terminate at the end of the 1989 grazing season. The management flexibility gained by eliminating this program will be needed to implement the changes recommended in the Blitzen Valley Management Plan.

In the 1987-88 season, a total of 36,268 Animal Unit Months (AUMs) of forage were removed. About 30% (11,387 AUMs) were taken under the emergency forage program while the remaining 70% (24,881 AUMs) were removed under regular permits. This is a slight decrease over the 1986-87 season level of 36,805 AUMs.

Figure I, page 33, summarizes refuge grazing levels from 1972 through 1988.

During the 1987-88 season, 46 of the 125 grazable fields (37%) were grazed during the dormant season. A total of 30,128 acres were grazed which amounts to about 32% of the grazable acreage of the refuge.

Rake-bunch grazing is used to treat meadows. This creates open shallow flooded areas for early season waterfowl pairing and feeding habitat. Meadows are cut in August when protein levels are about 8-10%. This vegetation is then raked into bunches and left until mid-winter. Cattle are then used to graze these bunches of higher quality forage. Adjoining uplands are generally not impacted since the protein levels in these areas are much lower. Biomass production on refuge meadows averages about 2,800 pounds per acre in a normal year, but can range from 800-4500 pounds per acre per year. About 85% of this biomass is usable as livestock forage when a rake-bunch graze treatment is applied. Using the standard AUM figure of 800 pounds of forage, it

follows that a treatment which allows for three AUMs per acre grazing intensity would remove 2400 lb of forage on a meadow site. Table X summarizes the grazing treatments in refuge fields. Treatment intensity is expressed in AUMs per acre.

Grazing intensity was lowest (.06 AUMs per acre) in the Upper Krumbo Field. This is a large crested wheatgrass seeding, but the permittee sold his herd at the end of the grazing period and no longer needed the forage. (He has since sold his ranch and the permit has been terminated.) The most intensively grazed field on the refuge was the East Big Juniper Field where 5.3 AUMs per acre were removed. This field is grazed to provide a wildlife feeding and pairing area. It is surrounded by idle fields which provide excellent nesting cover.

FIGURE I

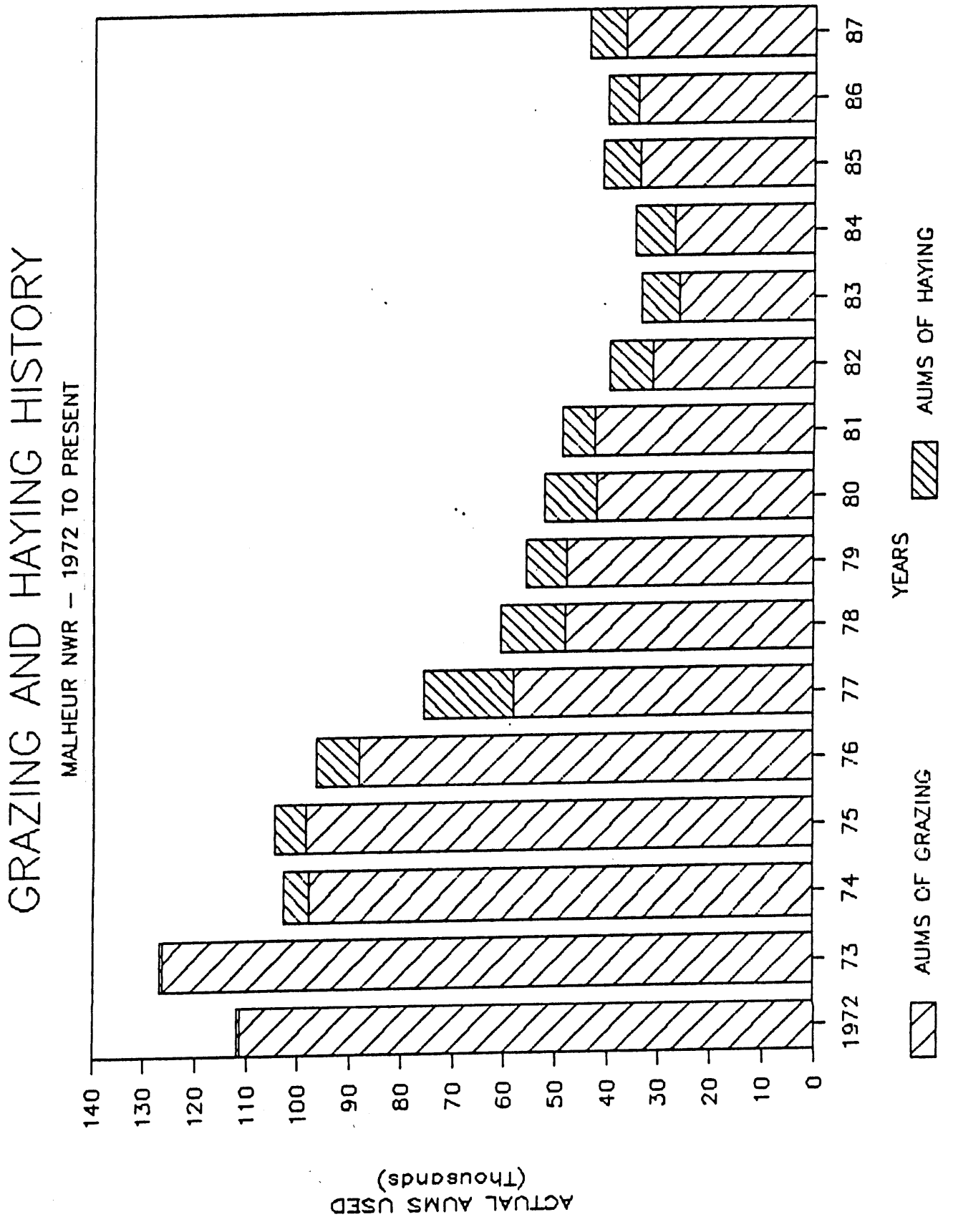
GRAZING AND HAYING HISTORY
MALHEUR NWR – 1972 TO PRESENT
ACTUAL AUMS USED
(Thousands)
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
1972
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
YEARS
AUMS OF GRAZING
AUMS OF HAYING

Table X Summary of grazing treatments and intensity on Malheur Refuge fields during the 1987-88 grazing season.

TYPE OF PERMIT	FIELD NAME	TREATMENT	ACRES	AUMS	AUMS/ACRE INTENSITY
Reg	West Freeman	RBG	432	224	.5
Reg	N. Stinking Lake	RBG	410	123	.3
Reg	Upper Swamp	RBG	255	989	3.9
Reg	S. Stinking Lake	RBG	615	298	.5
Reg	Plow	RBG	320	236	.7
Reg	Yriarte	RBG	502	764	1.5
HCEFP	Willard	RBG	456	340	.8
Reg	Horse	RBG	150	170	1.1
HCEFP	N.W. Big Sagebrush	RBG	4127	3038	.7
HCEFP	Rockford Lane	RBG	2474	910	.4
Reg	West East Big Sagebrush	RBG	1385	503	.4
Reg	Center Sagebrush	RBG	2718	2001	.7
HCEFP	Little Sagebrush	RBG	1393	822	.6
Reg	South Center	RBG	363	901	2.5
Reg	N. Meadow B	RBG	414	348	.8
Reg	N. Meadow A/N. Center	RBG	547	608	1.1
Reg	Larson	RBG	501	861	1.7
HCEFP	House	RBG	506	1459	2.9
Reg	Rimrock	RBG	576	1650	2.9
Reg	Jenkins	RBG	700	503	.7
Reg	South Swamp	GO	1320	440	.3
Reg	Retherford Lake	RBG	979	867	.9
Reg	Tipton	RBG	369	859	2.3
HCEFP	W. Center	RBG	275	181	.7
Reg	N. Swamp	RBG	688	1733	2.5
Reg	East Center	RBG	274	937	3.4
Reg	Witzel	RBG	154	513	3.3
Reg	Lower Krumbo # 1	RBG	156	654	4.2
Reg	Lower Krumbo # 2	RBG	105	306	2.9
Reg	Upper Krumbo	RBG	229	13	.1
Reg	South Krumbo # 2	RBG	184	294	1.6
Reg	W. Grain Camp	RBG	230	430	1.9
Reg	W. Hamilton	RBG	41	53	1.3
HCEFP	E. Upper Grain Camp	RBG	145	224	1.5
Reg	Dredger #1	GO	780	505	.6

able X continued

TYPE OF PERMIT	FIELD NAME	TREATMENT	ACRES	AUMS	AUMS/ACRE INTENSITY
Reg	Jones	RBG	759	1962	2.6
HCEFP	W. Boca Lake	RBG	406	656	1.6
HCEFP	South White	RBG	790	1004	1.3
Reg	Warm Springs	RBG	291	337	1.2
Reg	W. Big Juniper	RBG/HO	514	631	1.2
Reg	E. Big Juniper	RBG	219	1160	5.3
Reg	Faye	RBG	660	2096	3.2
Reg	South Meadow	RBG	883	2101	2.4
HCEFP	North Meadow	RBG	414	1439	3.5
HCEFP	Big Poison	GO	324	122	.4
Reg	Mud Creek	GO	95	430	4.5
TOTALS:			30,128	36,312	1.2

HO Hay only
GO Graze Only
RBG Rake-Bunch-Graze
HCEFP Harney County Emergency Forage Program
Reg Regular Permit

. Haying

Haying is used as a management strategy when it is desirable to provide mowed meadow conditions, but it is necessary to protect adjacent uplands and/or riparian zones. Under this treatment, permittees are required to cut, bale and remove the vegetation. Most haying is accomplished in early August. The amount of forage removed using this strategy has remained fairly constant during the past 12 years at about 2500 to 3000 tons per year. Figure I, page 33, summarizes the level of haying since 1972. Table XI shows tons of hay removed in each of the past 5 years. Table XII summarizes the haying program for the 1987-88 season.

Table XI Summary of actual forage removed by haying in the past 5 seasons.

PERMIT TYPE	1983-84	1984-85	1985-86	1986-87	1987-88
Regular Hay Tons	1042	582	727	1069	580
HCEFP Hay Tons	1993	2298	1603	1674	1825
TOTAL HAY TONS:	3035	2880	2330	2744	2405

Table XII Summary of hay removal by field for the 1987-88 season.

TYPE OF PERMIT	FIELD NAME	ACRES TREATED	TONS REMOVED	TONS /AC
HCEFP	Hughett	200	262	1.30
HCEFP	Willard	175	168	.96
Reg	Thoroughbred	75	113	1.50
Reg	Center Sagebrush	100	83	.83
HCEFP	Little Sagebrush	112	118	1.05
HCEFP	E. House	100	114	1.14
HCEFP	Suicide	207	321	1.55
HCEFP	E. Center	60	57	.95
HCEFP	M. Grain Camp	75	77	1.02
HCEFP	N. Little Juniper	198	289	1.46
HCEFP	Barley	100	142	1.42
Reg	Bridge Creek	438	384	.88
HCEFP	Island	333	277	.83
TOTALS:		2,173	2,405	1.1

The East House Field is the only area where a change has been made since last year's program. A fence was constructed to separate the House Field into two fields. The east half of this field was put into a hay only program which has allowed the upland areas to recover and provide excellent nesting habitat. Interspersed hayed meadow areas provide good pairing, feeding and brooding habitat. The west half of the field continues to be rake-bunch grazed to provide feeding and pairing habitat.

9. Fire Management

Wildfire

The refuge employed a four person fire crew this year, including a GS-5 crew leader, David Williamson; two GS-4 crew members, Marcy Haworth, Michelle Busse and one GS-3 crew member, Steven Shaw.

Photo by H.T.

The Malheur Refuge Fire Crew attended the Hart Mountain Fire Training Session. Here, the crew poses in front of the new refuge pumper #15. Left to right: Steve Shaw, Marcy Haworth, Michelle (Shelley) Busse, David Williamson, and David Johnson.

Assistant Manager Johnson provided overall guidance to the crew, but day to day supervision was provided by the crew leader, Williamson. Table XIII summarizes the fire crew's training.

Table XIII Fire crew training for the 1988 fire season at Malheur Refuge.

TYPE OF TRAINING	SOURCE
Orientation, Pumper Training	Johnson
Defensive Driver, First Aid	BLM
CPR, Agency Coordination	"
Fire Fighting Techniques	"
Chainsaw, Pumps, Hydraulics	"
Fire Line Construction	Hart Mtn. Fire School
Pumper Driving	"

This crew was involved in only three wildfires this year. We had a very quiet fire season in spite of the very dry conditions. Table XIV summarizes 1988 wildfires.

Table XIV Wildfires fought by the Malheur Refuge fire crew during 1988.

DATE	FIRE NAME	FIRE #	# ACRES	NOTES
Aug 04	Dredger Peat	1055	.5	Peat Burn from 1987
Aug 10	BLM Assist	1058-H1	30.0	Near Wrights Point
Aug 30	Shirt Creek	1070-M1	5000.0	BLM fire near Baker, OR

In addition to the training and wildfire suppression efforts of the 1988 fire crew, the following project work was completed by the crew:

PROJECTS AND DUTIES:

1. Converted old military Jeep to fencing truck
2. Improved fire caches (build shelves, etc.)
3. Stocked and prepared fire pumpers #15 & #16 (winch, new bumper, foam unit, build chainsaw box)
4. Made daily weather reports
5. Constructed water gap in Dredger #1 Field
6. Repaired boundary fence (1 mile) in Dredger #1 Field
7. Installed cattle guard and gates
8. Constructed 1/2 mile new fence at Double-O
9. Constructed new gates on West Canal and Rock Crusher Point
10. Constructed 2 3/4 mile of new fence in South Meadow Field, House Field and Harney Lake area

In August 1987, approximately 8 acres in the South Swamp Field were sprayed with Rodeo TM to create a pond in a monotypic stand of hardstem bulrush. This photograph reveals the pattern of dead vegetation during the green-up in the spring of 1987 following a winter burn.

Regrowth of untreated vegetation provided a nice mosaic of vegetation and open water. This photograph shows the pattern one year after treatment. A pair of trumpeter swans was attracted to this new pond site during the nesting season.

11. Helped stock fish, band waterfowl and willow flycatchers
12. Cut and placed rip-rap on Blitzen River
13. Botulism clean-up

Overall, this crew did a fine job of improving this station's level of fire readiness and wildfire response capability.

Prescribed Burning

The emphasis of our prescribed burning program has shifted in the past couple of years from large (>1000 acres) burns to smaller (<200 acres) burns. Original efforts were aimed at converting extensive stands of sagebrush to grass-dominated uplands with the intent of providing improved nesting cover. However, by 1987, sufficient upland areas had been converted to grassland and emphasis is now concentrated on treating marshes. Many ponds have become very solid stands of hardstem bulrush, cattail and burreed. Fire is used to remove this cover in an effort to provide an interspersion of open water and emergent vegetation. These burns are complex and often expensive to conduct due to continuity of fuel types and very erratic fire behavior, but the result has been very positive response by wildlife early in the spring as pairing and feeding habitat. However, this response is usually short-lived since the invigorated emergent plants quickly choke out any open water. By mid-June, it is hard to detect any differences in treated and un-treated areas. This observation has stimulated experiments with multiple treatments to provide longer-term conditions. Examples:

1. Fall burning followed by winter deep flooding - cautions include burning during very extreme conditions, high potential for escape and potential of inadequate winter water for reflooding. However, it appears to be an effective means of killing off emergent growth and opening marshes. Examples of successful burns include Knox Swamp Pond and Darnell Pond.

2. Fall application of herbicide (Rodeo TM) in late July, followed by winter burning and spring flooding - cautions include spraying during the optimum period when the emergent plants are re-charging root reserves, very expensive chemical, herbicide drift, logistics of application. We have found helicopter application to be the most efficient and cost effective. This strategy appears to have excellent results with long term effects. Examples of successes include South Swamp Pond, Cottonwood Pond, Dredger Pond, State Corral Pond, North Meadow B Pond, and Jones Pond. All of these ponds showed a dramatic increase in open water interspersion and submergent vegetation production. A corresponding wildlife response was also observed.

The 1988 Prescribed Burn Program involved 12 burns on 3,077 acres. These burns ranged from 9 acres to 1100 acres in size. The cost averaged about $2.16 per acre, but ranged from $109.00 per acre to about $0.50 per acre. Table XV summarizes the 1988 burn program.

Table XV Prescribed burns on Malheur Refuge, 1988.

1988 PRESCRIBED BURN SUMMARY					
DATE	FIRE NAME	ACRES	ACTUAL COST	HATITAT TYPE	$/ACRE
10/15/87	Suicide	9	$ 984.16	Marsh	$109.35
01/28/88	N. White	30	57.00	Meadow/Marsh	1.90
02/02/88	Benson Pond	160	336.00	Marsh	2.10
02/04/88	South Swamp	1100	578.00	Marsh	.53
02/04/88	Jones Pond	450	304.00	Marsh	.68
02/12/88	Dredger Pond	160	364.00	Marsh	2.28
02/12/88	Hwy 205 emerg.	60	553.00	Marsh	9.22
02/26/88	House Ditch	20	546.00	Marsh	27.30
03/03/88	Baker	380	1169.00	Meadow	3.08
03/10/88	Islands	6	260.00	Marsh	43.33
03/24/88	N. Meadow B	8	716.00	Marsh	89.50
04/05/88	"OO" Emergents	700	787.00	Marsh	1.12

10. Pest Control

The Center Patrol Road was not sprayed for noxious weeds this year for a second year. After the county applicator of seven years transferred to southern California, Harney County was unable to retain an applicator with the proper certification for spraying county road right-of-ways for more than two weeks at a time. Meanwhile, Canadian thistle and perennial pepperweed continue to spread.

Norman Ranches sprayed 250 acres of the East Grain Camp and West Knox Pond grain fields with 2,4-D amine at 1.5 pints/acre for control of noxious weeds (Canadian thistle).

11. Water Rights

In April and June 1987, a local rancher, Dwight Hammond, filed a water right application with the State to appropriate up to 3.5 cfs of water from Krumbo Creek and store it in Kern Reservoir for subsequent use on 429 acres of irrigated alfalfa croplands on his ranch.

The Service, Oregon Department of Fish and Wildlife, BLM, Trout Unlimited, Oregon Trout, and Water Watch, Inc., enjoined to formally protest the application in April 1988. The Service, represented by the Regional Solicitors Office, contended that the proposed use of Krumbo Springs and Reservoir would be detrimental to the public interest in the following ways:

1. The application adversely impacts vested water rights of the Service.

2. Insufficient water is available to satisfy the Service and applicant.

3. The application would impair minimum stream flows necessary to sustain trout fisheries in Krumbo Creek and Reservoir.

4. Highest and best use of water is for fish and wildlife resources.

5. The application would detrimentally impact Krumbo Valley riparian habitat.

Two contested hearings were scheduled back-to-back at Harney County Court,Burns, Oregon on November 2, 1988. First, Hammond claimed the refuge lost some vested water rights in Krumbo Valley due to a 5 year period of non-use, after the failure of his dam washed out the refuge's Krumbo Reservoir. The second hearing would determine the fate of any "lost" water rights that were available for appropriation to a beneficial use, i.e., his irrigated cropland.

On December 30, 1988 a negotiated agreement was worked out during the protracted contested case proceedings. The eleven part "non-separable agreement" was signed by all parties after intense "last minute negotiations". The Acting Regional Director signed off on January 9, 1989. Details of the implementation of the agreement will be worked out during the 1989 irrigation season.

Basically, the Service did not lose any vested water rights. Minimum stream flows to Krumbo Creek and trout fisheries will be maintained year round. Hammond will not contest additional Service and Oregon Department of Fish and Wildlife water storage rights applications and/or "Duffy decree" realignments . The Hammonds can divert from Krumbo Creek between October 1 and April 30 when mainstream flow is greater than 3.3 cfs, and the west fork is greater 2.5 cfs, but not more than 4.5 cfs diversion at any one time.

G. WILDLIFE

1. Wildlife Diversity

A list of unusual bird sightings from 1988 appears in Table XVI.

Table XVI Unusual bird sightings, Malheur Refuge, Oregon, 1988.

SPECIES	DATE
Common Loon	15 October; 4 November
Least Bittern	24 May
Cattle Egret	26 April; 8 May
Eurasian Wigeon	10 February; 4 April
Osprey	12, 29 April; 14 July; 24 August; 20 September
Merlin	26 April
Peregrine Falcon	15 April; 6 October
Black-bellied Plover	16 May
Solitary Sandpiper	3 September
Marbled Godwit	19 July; 24 August
Pectoral Sandpiper	10 September-12 October
*Glaucous-winged Gull	19 December
Flammulated Owl	28-29 May
Northern Saw-whet Owl	25 June; 14 October
Vaux's Swift	9 May; 16 September
White-throated Swift	16 May
Calliope Hummingbird	6 June
Williamson's Sapsucker	22 September
Hammond's Flycatcher	15 September
Least Flycatcher	4 June
Bewick's Wren	27 June
Blue-gray Gnatcatcher	3 June
Veery	12 October
Gray Catbird	8 June; 11, 12 October
Northern Mockingbird	18 April; 10 October
Brown Thrasher	7 June
Red-eyed Vireo	27 May; 6-11 June
Northern Parula	1 June
Chestnut-sided Warbler	10 June; 8, 29 September; 2 October
Black-throated Blue Warbler	16, 29 September; 12-16 October
Black-throated Gray Warbler	11, 22 May
Magnolia Warbler	25, 28-29 May; 7 June
Townsend's Warbler	2 June
Bay-breasted Warbler	16-23 September
Blackpoll Warbler	21 May; 7 June; 3-4 September
Black-and-white Warbler	22 May
Blackburnian Warbler	29 May
American Redstart	6-7, 11 June; 26 August; 3 October
Canada Warbler	2-4 September
Ovenbird	5 June; 3 September

*=New refuge record

TABLE VII (Continued)	
SPECIES	DATE
Northern Waterthrush	25 May; 2 September
Summer Tanager	30 September
Rose-breasted Grosbeak	4 June
Harris's Sparrow	15 May
Indigo Bunting	25 May-3 June
Snow Bunting	6 January; 16 December
Common Grackle	21 May
"Baltimore" Oriole	22 May-5 June
Purple Finch	16 October
Rosy Finch	16 December

2. Endangered and/or Threatened Species

Peregrine falcon sightings have apparently been increasing in recent years, probably due the recent increases of breeding peregrines in Oregon. Three separate sightings were reported for the refuge this year. The most interesting report was of a pair seen at Warbler Pond in the Double-O Unit on 15 April.

The refuge staff again participated in winter bald eagle roost counts. The counts are a multi-agency effort to document winter bald eagle numbers in Harney Basin. The data showed a peak of 152 eagles in mid March. The highest count of bald eagles on the refuge was 37 on 4 January.

3. Waterfowl

Midwinter Census

The midwinter waterfowl survey revealed 2695 Canada geese, 24 trumpeter swans, 2 tundra swans, and 1574 ducks using the refuge.

Spring Migration

Spring migration began in February with the arrival of northern pintails, tundra swans, and snow geese. Peak numbers and dates for selected spring migrants appear in Table XVII.

Table XVII Estimated spring waterfowl peaks, Malheur Refuge, 1988.

SPECIES	NUMBER	DATE
American Wigeon	1,300	2 March
Canada Goose	2,100	2 March
Canvasback	200	4 April
Green-winged Teal	800	2 March
Mallard	6,000	4 April
Northern Pintail	3,000	2 March
Northern Shoveler	1,200	4 April
Ruddy Duck	3,000	5 May
Snow Goose	1,100	2 March
Tundra Swan	200	2 March

Total spring duck use on the refuge was down from last year. Continued deep water, widespread failure of emergent vegetation, and near total decimation of sago pondweed virtually eliminated most of the spring waterfowl maintenance on Malheur Lake. Table XVIII summarizes spring waterfowl use-days for ducks, geese and swans.

Table XVIII Spring waterfowl use-days (February 1 - May 31) for Malheur Refuge, 1984-88.

	Use-Days in Thousands				
SPECIES	1984	1985	1986	1987	1988
Tundra Swan	83.0	30.0	43.0	11.0	12.5
Trumpeter Swan	6.9	4.7	3.4	5.7	4.9
Geese	1,220.0	576.0	285.0	958.0	265.8
Ducks	2,265.0	1,204.0	2,088.0	1,623.6	1,330.2
TOTALS:	3,574.9	1,815.2	2,419.4	2,598.3	1,613.4

Trumpeter Swans

Eight trumpeter swans were produced on Malheur Refuge in 1988, by five nesting pairs. Nesting pairs had declined from nine in 1987, and production was seven less than the previous ten-year average. Average brood size was 2.0, also below average. The low production was due partially to loss of breeding adults during winter. Two adult females and one adult male were found dead, all of which had been breeding birds. Water shortages, due to the drought conditions, also was believed responsible for the low production. Table XIX summarizes historic swan production data for the population.

Table XIX Summary of trumpeter swan production in Eastern Oregon, 1985-88.

YEAR	YOUNG PRODUCED	MEAN BROOD SIZE (ACTUAL SIZES)*	NO. OF SUCCESSFUL BROODS
1958	4	2.0	2
1959	0	0.0	0
1960	14	2.8 (5,3,3,2,1)	5
1961	0	0.0	0
1962	3	1.5 (2,1)	2
1963	17	3.4	5
1964	6	2.0	3
1965	11	2.8 (5,3,2,1)	4
1966	12	3.0 (5,3,3,1)	4
1967	12	4.0 (6,4,2)	3
1968	11	2.2 (4,2,2,2,1)	5
1969	14	3.5 (5,4,4,1)	4
1970	13	3.3 (4,4,3,2)	4
1971	22	3.6 (5,4,4,4,3,2)	6
1972	13	2.6 (3,3,3,2,2)	5
1973	4	4.0 (4)	1
1974	9	3.0 (5,2,2)	3
1975	7	2.3 (4,2,1)	3
1976	8	4.0 (4,4)	2
1977	0	0.0	0
1978	13	2.6 (4,3,2,2,2)	5
1979	33	3.3 (6,5,5,4,3,3,3,2,1,1)	10
1980	15	2.1 (4,4,2,2,1,1,1)	7
1981	9	3.0 (3,3,3)	3
1982	17	2.8 (6,3,3,3,1,1)	6
1983	17	2.8 (5,4,3,2,1,1)	6
1984	6	3.0 (3,3)	2
1985	2	1.0 (1,1)	2
1986	24	3.4 (6,6,3,3,3,2,1)	7
1987	14	2.3 (4,4,3,1,1,1)	6
1988	8	2.0 (3,2,2,1)	4
	338	2.8 average	119

*Brood size that fledged
**Numbers of pairs that fledged at least one young.

Canada Geese in Blitzen Valley

Canada Goose Production

Estimated pairs of Canada geese this year were 870, up from the estimated 764 in 1987. Estimated goose production was 1559, 46% lower than in 1987, yet higher than the preceding 10-year average of 1,338. Predator control was a major factor in maintaining high production despite a poor year for brood water. Nest success for Canada geese refuge-wide was 47% in 1988, the lowest rate recorded since the predator control program began in 1986.

Duck Production

The breeding duck population was an estimated 10,621 pairs, up 8% from 1987. High water on Malheur Lake, high carp populations, and low continental waterfowl populations all contributed to low breeding population. The most common breeding duck in 1988 was the cinnamon teal, followed by mallard, gadwall and redhead. Estimated breeding pair numbers are summarized in Table XX.

Table XX Estimated duck breeding pairs, Malheur Refuge, 1985-88.

SPECIES	1985	1986	1987	1988	% CHANGE FROM 1987
Mallard	1687	1803	1524	2284	+ 50%
Gadwall	1621	1761	1880	1637	- 13%
Northern Pintail	227	422	227	267	+ 18%
Green-winged Teal	105	191	137	113	- 18%
B.W./Cin. Teal	4495	4074	3797	3884	+ 2%
American Wigeon	91	203	264	248	- 6%
Northern Shoveler	446	713	675	528	- 22%
Dabbler Subtotal	8672	9167	8504	8961	+ 5%
Redhead	825	1328	918	993	+ 8%
Canvasback	108	142	130	115	- 11%
Lesser Scaup	35	40	53	104	+ 96%
Ring-necked Duck	7	34	29	11	- 62%
Ruddy Duck	229	220	191	404	+112%
Common Merganser	5	11	5	18	+260%
Diver Subtotal	1206	1775	1326	1660	+ 25%
TOTAL DUCK PAIRS	9878	10942	9830	10621	+ 8%

Standard duck production calculations showed duck production to be 29,446, up 14% from 1987 and 2% above the ten-year (1978-87) average. Estimated coot production was 244% higher than in 1987. Calculations showed mallards and cinnamon teal production substantially higher than the ten-year average, with mallards reaching a record since 1977. All dabblers showed production higher than average except gadwalls, while all divers continued to be below average, primarily due to poor habitat conditions in the lakes caused by carp and high water.

Production was good in predator control units (Blitzen Valley and Double-O) and was assumed to be poor in the lake units due to poor habitat conditions.

The improved production estimate this year was partially due to a 5% increase in dabbler pairs, a 25% increase in diver pairs, and an 87% increase in coot pairs over 1987. Improved nest success rates for some species also increased the production estimate.

A Re-evaluation of Production:

Duck production estimates were calculated following the procedure defined in the Wildlife Inventory Plan. The procedure calculates production based on pair estimates and nest success rates, but does not account for the number of pairs which do not nest, the frequency of renesting, or brood mortality. The formula provides good trend data for production estimates, however; it grossly overestimates actual production if brood losses are high. High brood mortality has probably been the case during most recent years at Malheur Refuge and was particularly evident in 1988. Although the calculations indicated increased production over 1987 levels, our field observations of broods suggested much lower production than in 1987.

Because of the apparent large discrepancy between production estimate and actual production, we decided to revise standard production estimates this year by adjusting them for brood mortality. Brood survival indices were calculated for each species based on the brood survey data collected in mid July. The data available was poor for this purpose because only one brood count was conducted and broods of the various species were of different ages. Because of the low quality data available this year, the intent of this exercise was to illustrate the importance of accounting for brood survival in production estimates and provide a very rough (yet perhaps more accurate) estimate of production. The method developed to estimate brood survival for 1988 should be considered tentative and subject to further refinement. We plan to design a system to provide better estimates of brood survival beginning in 1989 for future use in production estimates. The method used in 1988 is described on the next page.

1. CALCULATE EXPECTED BROODS: Calculate the number of broods expected to be observed for the area surveyed in each biological unit, using the following formula:

ESTIMATED[1] PAIRS X NEST SUCCESS = TOTAL BROODS HATCHED X PERCENT OF HABITAT SURVEYED X

ACTIVE BROOD INDEX X VISIBILITY INDEX = NUMBER OF BROODS EXPECTED TO BE OBSERVED

The active brood index is the percentage of the broods of a given species which are hatched but unfledged during the survey period, based on hatching curves for each species. The brood visibility indices used were from Hammond's Waterfowl Brood Survey Manual.

2. CALCULATE APPARENT SURVIVAL: Brood survival rates on the brood survey date were calculated using the following formula:

$$\frac{\text{NUMBER OF BROODS OBSERVED}}{\text{NUMBER OF BROODS EXPECTED}} = \text{APPARENT SURVIVAL RATE}$$

3. CALCULATE OVERALL SURVIVAL: The apparent survival rates reflect brood survival up to the date of the survey. Since additional brood mortality is expected to occur after the survey and before fledging, true survival rates would be lower. After reviewing the literature on duck brood survival we found that about 85% of brood mortality occurs during age-class 1, about 10% occurs during age-class 2, and about 5% occurs during age-class 3. Using the average age of the broods of each species from the brood survey, the percent mortality that had occurred up to the date of the survey was estimated. The following formula was used to compute overall survival:

1 - APPARENT SURVIVAL = APPARENT MORTALITY

$$\frac{\text{APPARENT MORTALITY}}{\text{PERCENT MORTALITY TO DATE}} = \text{ESTIMATED MORTALITY RATE}$$

OVERALL SURVIVAL (SURVIVAL INDEX) = 1 - ESTIMATED MORTALITY RATE

Enough data were available to calculate brood survival indices for mallards, gadwalls, northern pintails, cinnamon teal, American wigeon, northern shovelers, canvasbacks, redheads, and ruddy ducks. Calculated brood survival indices appear in Table XXI long with revised production estimates. For some species, data were unavailable to calculate survival. survival rates for the most ecologically similar species were used in computing their production.

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[1]. Assumes all pairs nest and no renesting occurs.

Table XXI Revised duck and coot production estimates, after applying brood survival indices to standard production estimates, Malheur Refuge, 1988.

SPECIES	STANDARD PRODUCTION ESTIMATE	X	BROOD SURVIVAL INDEX	= REVISED PRODUCTION
Mallard	8112		.0538	36
Gadwall	3635		.5904	2146
Northern Pintail	1280		.2334	299
Green-winged Teal	583		.0925*	54
Cinn./Blue-winged Teal	10076		.0925	932
Wigeon	532		0	0
Northern Shoveler	1462		.0967	141
TOTAL DABBLERS	26580		-----	4008
Canvasback	272		.3365	92
Redhead	2349		0	0
Ruddy Duck	435		0	0
Ring-necked Duck	570		0*	0
Lesser Scaup	33		0*	0
Common Merganser	67		0*	0
TOTAL DIVERS	3732		-----	92
TOTAL DUCKS	29446		-----	4100

* Brood survival index applied from ecologically similar species, because insufficient data was available for these species.

This method yielded a gadwall survival index which appeared too high in comparison with other species and also yielded survival indices of zero for redheads, ruddy ducks and American wigeon. These atypical indices may have been due to inadequate sample size for some species and may be related to incorrect assumptions about mortality rates versus duckling age for others.

The standard production estimate yielded about 2.8 ducklings fledged per pair. This is a very high recruitment level which is unlikely to occur. The revised production estimate yielded about 0.4 duckling fledged per pair, a much more realistic number based on our brood observations.

Coot Production

Estimated American coot production was 10,782 - up sharply from last year's estimate; however, this figure does not account for brood survival, and actual production was very much lower in 1988 (based on the apparent lack of broods).

Fall Migration

The fall waterfowl migration passed with almost no major concentrations of migrants. The exception was a concentration of approximately 9,000 common mergansers on Harney Lake on December 6. Although fall use was up slightly from 1987's record low, high water, which left much of Malheur Lake too deep for feeding, combined with the near-total failure in sago pondweed production kept fall waterfowl use low (Table XXII). Table XXIII shows 1988 waterfowl peaks on the refuge.

Table XXII Fall waterfowl use-days (Sept. 1-Dec. 1) on Malheur Refuge, 1984-88.

SPECIES	Use-days in Thousands				
	1984	1985	1986	1987	1988
Tundra Swan	32.0	0.4	55.0	4.7	6.9
Trumpeter Swan	10.4	6.2	3.9	7.4	6.2
Geese	859.0	496.0	446.0	440.0	513.6
Ducks	2,569.0	2,254.0	1,916.0	1,743.0	1,859.8
TOTAL:	3,470.4	2,756.6	2,420.9	2,195.1	2,386.5

Table XXIII Estimated fall waterfowl peaks on Malheur Refuge.

SPECIES	1988		RECENT FALL PEAKS	
	NUMBER	PERIOD	NUMBER	YEAR
American Wigeon	700	6 Oct	21,440	1979
Canada Goose	3,100	6 Dec	10,625	1983
Canvasback	---	-----	20,950	1979
Green-winged Teal	2,000	6 Oct	17,750	1982
Mallard	2,700	30 Aug	31,230	1980
Northern Shoveler	1,000	6 Oct	22,580	1979
Redhead	300	30 Aug	17,700	1979
Snow Goose	550	18 Nov	8,000	1979
Tundra Swan	140	18 Nov	31,230	1980
Common Merganser	9,000	6 Dec	9,000	1988

4. Marsh and Waterbirds

Colonial Nesting Waterbirds

Nesting colonial waterbirds were censused cooperatively with Oregon Department of Fish and Wildlife on the refuge, and elsewhere in Harney Basin. In 1988, drought conditions, coupled with rapidly declining lake levels, and continued deterioration of existing rookery habitat due to wind, wave and ice action, caused reductions in production.

A total of 26 active colonies were located in the basin in 1988. Thirteen of the 1987 colonies were not used in 1988 and six new colonies developed. Most colony abandonment was due to dry colony sites caused by drought and lowering Malheur Lake levels. Only 13 colonies were on the refuge. Most of the colonies contained a mix of species. Tables XXIV, 1 and 2, summarizes numbers of nesting pairs of some key colonial nesting species. Table XXV summarizes production estimates.

Table XXIV - A Estimate of nesting pairs of key colonial birds using the Malheur-Harney Lakes Basin, 1966-88.

YEAR	DOUBLE-CRESTED CORMORANT	GREAT BLUE HERON	BLACK-CROWNED NIGHT-HERON	GREAT EGRET	SNOWY EGRET	WHITE-FACED IBIS	FRANKLIN'S GULL
1966	125	200	600	400	50	10	250
1967	50	125	250	200	60	15	250
1968	50	100	500	400	150	20	250
1969	45	110	500	400	150	20	250
1970	50	100	500	180	55	25	500
1971	45	110	750	150	35	20	600
1972	70	150	750	285	80	25	500
1973	85	200	775	230	125	55	1000
1974	75	200	1000	350	140	80	1000
1975	60	210	360	100	55	40	0
1976	40	190	400	200	80	25	200
1977	70	200	375	125	50	110	10
1978	20	40	525	400	135	190	520
1979	80	205	730	415	40	150	1100
1980	180	320	320	200	140	600	1250
1981	235	320	270	170	115	650	1330
1982	360	472	700	550	175	900	900
1983	330	448	745	755	100	420	150
1984	829	572	245	545	141	910	450
1985	739	531	379	562	227	1420	200
1986	982	682	493	631	113	2095	520
1987	1120	568	235	290	89	2475	1010
1988	665	682	45	36	18	2840	725

Table XXIV - 2

YEAR	WHITE PELICAN	CASPIAN TERN	CALIFORNIA GULL	RING-BILLED GULL	CATTLE EGRETS
1966	0	0	no data	no data	0
1967	0	0			0
1968	0	0			0
1969	0	0			0
1970	0	0			0
1971	0	0			0
1972	0	0			0
1973	0	0			0
1974	0	0			0
1975	0	0			0
1976	0	0			0
1977	0	0			0
1978	0	0			0
1979	0	0			0
1980	0	0			0
1981	0	0			0
1982	0	0			0
1983	0	3	400	25	0
1984	0	350	600	150	2
1985	3	350	520	550	2
1986	150	400	670	580	6
1987	578	150	705	175	0
1988	2045	80	50	500	0

The only eared grebe colony located contained 75 nests and was in East Knox Pond. East Knox Pond was also the only known nesting area used by western grebes (5 pairs) in 1988. Virtually no emergents were available for grebe nesting in Malheur, Mud, or Harney Lakes again this year.

American white pelicans were a refuge highlight again this year as nesting increased dramatically. A record 2045 pairs nested on five islands in Malheur lake. An estimated 950 young were fledged. On the negative side, two island colonies were abandoned, causing a loss of 835 nests following an illegal visit by someone (presumably an artifact hunter).

Table XXV Colonial-nesting waterbird production summary, Malheur Refuge and Harney Basin, 1988.

SPECIES	# PRODUCED ON REFUGE	# PRODUCED OFF-REFUGE	TOTAL
American Pelican	88	862	950
Double-crested Cormorant	276	149	425
Great Blue Heron	449	40	489
Great Egret	0	0	0
Snowy Egret	0	0	0
Cattle Egret	0	0	0
Black-crowned Night-heron	0	0	0
White-faced Ibis	1875	0	1875
Franklin's Gull	673	0	673
California Gull	0	30	30
Ring-billed Gull	0	0	0
Caspian Tern	0	0	0

Pelicans were the only colonial species that showed increased production in 1988. Although record pair numbers were recorded for white-faced ibises, production was lower in 1988 due to declining water levels at some colony sites. Six species produced no young in 1988 due to unsuccessful nesting attempts caused by the drought conditions.

Greater Sandhill Cranes

A total of 67 crane nests were monitored to determine success. Nest success was 76%, the highest ever recorded for the refuge population which has been monitored since 1966. Unfortunately, due to the drought and poor feeding conditions, the majority of the refuge cranes departed the area before a count of young could be made. Production counts are normally made on 15 September. Most of the cranes had departed before the 10th. For further information regarding the predator control program, see Section G-15.

Peak fall crane use occurred in mid-August and was primarily composed of the local population. Apparently very few migrants used the refuge, presumably due to the poor feeding conditions brought about by the drought. All cranes were gone by 27 September, a very unusual early migration. Total autumn use-days were 12,163 which is a record low since the data collection began in 1973 (Table XXVI).

Table XXVI Greater sandhill crane fall use-days on Malheur NWR, Oregon.

YEAR	CRANE FALL USE-DAYS
1973	44,916
1974	31,043
1975	118,569
1976	70,401
1977	176,769
1978	104,302
1979	161,537
1980	101,209
1981	89,445
1982	143,566
1983	64,884
1984	95,309
1985	53,354
1986	34,075
1987	40,834
1988	12,163

First refuge record of a sandhill crane chick becoming entangled in barbwire.

First refuge record of a sandhill crane chick becoming entangled in barbwire.

5. Shorebirds, Gulls, Terns, and Allied Species

Long-billed curlews broke their previous spring arrival date record when they showed up on 8 February (previous record was 20 March). Franklin's gulls also showed up early (on 11 March), breaking their previous record of 3 April.

A pair of semipalmated plovers was observed during the breeding season at Stinking Lake in the Double-O Unit. Presumably this was the same pair which provided Oregon's first nesting record in 1987. No evidence of breeding by the pair was observed after two visits to the area.

Snowy plover numbers increased on Stinking Lake in 1988. A survey in late June revealed 30 adults.

A colony of Caspian terns on an island in north Malheur Lake failed to produce any young. Declining lake levels caused the colony to become part of the mainland resulting in abandonment. Franklin's gulls nested at Ibis Pond and Knox Pond. No ring-billed gulls, and only 30 California gulls were produced in the basin.

Declining water levels of Malheur, Mud, and Harney Lakes continued to provide excellent mudflat habitat and fall shorebird use in the area was high.

6. Raptors

Spring Migration

Turkey vultures arrived on 12 February, breaking their old spring migration record by six days.

Quarterly Raptor Counts

In January, we called an inter-agency meeting to achieve multi-agency cooperation in continuing data collection for quarterly raptor routes. Oregon Department of Fish and Wildlife, Nongame Biologist, Chris Carey agreed to take the lead in coordinating interagency efforts to continue and expand our coverage on the counts. Personnel from the Forest Service, Bureau of Land Management, Oregon State University (Squaw Butte Experiment Station), Department of Fish and Wildlife, and the refuge are to assist in the data collection.

Golden Eagles

Golden eagle nests in the vicinity of the refuge were monitored again in 1988. Of the 30 total nesting territories monitored, 28 were active, as indicated by the presence of adult birds in the immediate area. Of these, 20 nests (71%) were successful in fledging of at

lease one young. These 20 nests produced a total of 33 young, for an average of 1.10 young per nest. This information, along with that since 1966, is detailed in Table XXVII.

Table XXVII Golden eagle breeding data 1940-88, on and adjacent to Malheur Refuge in southeast Oregon (sample size in parentheses).

Year Occupied	No. Fledged Per Breeding Territory	No. Fledged Per Per Successful Nest	Total No. Fledged	Successful Nests: No. of Breeding Territories Checked
1940	0.86 (n=7)	1.50 (n=4)	6	57% (n=7)
1966	1.00 (n=6)	1.50 (n=4)	6	57% (n=7)
1967	1.40 (n=10)	1.75 (n=8)	14	73% (n=11)
1968	1.60 (n=5)	2.00 (n=4)	8	57% (n=7)
1969	1.67 (n=6)	1.67 (n=6)	10	66% (n=9)
1970	1.00 (n=8)	1.60 (n=5)	8	45% (n=11)
1971	0.89 (n=9)	2.00 (n=4)	8	40% (n=10)
1972	0.50 (n=10)	1.67 (n=3)	5	27% (n=11)
1973	0.20 (n=10)	2.00 (n=1)	2	8% (n=13)
1974	0.55 (n=11)	2.00 (n=3)	6	25% (n=12)
1975	-- --	-- --	--	-- --
1976	1.00 (n=8)	1.60 (n=5)	8	55% (n=9)
1977	1.50 (n=8)	2.00 (n=6)	12	60% (n=10)
1978	1.62 (n=13)	1.75 (n=12)	21	75% (n=16)
1979	1.06 (n-16)	1.42 (n=12)	17	71% (n=17)
1980	1.39 (n=18)	1.67 (n=15)	25	83% (n=18)
1981	1.20 (n=18)	1.38 (n=13)	18	72% (n=18)
1982	0.50 (n=22)	1.57 (n=7)	11	32% (n=22)
1983	0.14 (n=21)	1.50 (n=2)	3	9% (n=22)
1984	0.50 (n=28)	1.40 (n=10)	14	36% (n=28)
1985	0.16 (n=28)	1.17 (n=4)	5	14% (n=28)
1986	0.25 (n=24)	1.50 (n=4)	6	17% (n=24)
1987	0.57 (n=30)	1.42 (n=12)	17	40% (n=30)
1988	1.10 (n=30)	1.65 (n=20)	33	67% (n=30)
Pooled Mean	0.75 (n=346)	1.60 (n=165)	263	48% (n=370)

7. Other Migratory Birds

Unusual sightings of birds in 1988 are summarized in Table XVI.

Raven Nesting

A raven nest survey was conducted by biological technician, Brett Hodgson. A total of 66 historic nest sites were monitored in the area, 14 of which were active in 1988. The predator control program (see Section G15) has reduced the local breeding population.

Bobolinks

A bobolink survey was conducted cooperatively with the Oregon Department of Fish and Wildlife on June 6 (Table XXVIII). Overall, 179 male bobolinks were recorded on the transects, down slightly from 1987. This decline probably represents birds shifting to areas that were not surveyed, because a few bobolinks were observed in other areas this year.

Table XXVIII Summary of the number of male bobolinks recorded on survey transects of Malheur Refuge, 1984-87.

Transect	1984	1985	1986	1987	1988
Sodhouse	61	31	26	14	11
Brenton Cabin	93	59	52	37	45
Bridge Creek	26	15	27	47	20
P-Ranch	20	26	35	25	28
North Meadow	0	no data	67	84	77
TOTALS:	200	131	207	207	179

A light graze-only treatment in the Baker Field resulted in a count of 6 male bobolinks in the field. This area had been in idle management for 4 years and the bobolink population had disappeared from the area in 1986. It is very interesting that a very light grazing treatment apparently attracted bobolinks back to the field. A few bobolinks were observed along the west part of the field which had been burned. These birds were not along the original transect, yet they were apparently attracted to the area this year due to the vegetation changes associated with the burn.

Christmas Bird Counts

Two Christmas Bird Counts were conducted on the refuge on December 18 and 19. Highlights of the P-Ranch count included: one hermit thrush and one western bluebird. Unusual species on the Sodhouse count included: 7 white pelicans, one glaucous-winged gull (a new refuge record) and 3 American goldfinches. All of these species are very rare here during winter.

8. Game Mammals

Big game populations remained high in the area, following record high counts in the area in 1987. Due to the second consecutive year of drought, food conditions were poor and deer suffered high mortality rates by late fall. Pronghorn population counts showed record high numbers in 1988.

10. Other Resident Wildlife

Upland Game Birds

Local populations of quail, pheasant, and chukar experienced a low production year in 1988, while sage grouse production was very high.

Muskrats

The annual Malheur Lake muskrat house survey in late January showed muskrats at a very low level, the lowest since 1971. Continued high water and lack of emergents in Malheur Lake continued to limit the population.

Rabbits

Rabbit numbers continued their slow increase in 1988. The population has been growing slowly since its crash in 1981 when rabbits were common, but not abundant.

Coyotes

According to the Oregon Department of Fish and Wildlife, the coyote numbers in the Harney County area were up significantly in 1988 compared to 1987. Coyote numbers were 162% of normal versus 72% of normal in 1987, based on their long-term trend data (1942-1988).

11. Fisheries Resources

On 13 August, a group of volunteers from Trout Unlimited, Oregon Department of Fish and Wildlife along with the refuge fire crew, assisted refuge staff in rip-rapping cutbank areas along the Blitzen River between Page Springs Dam and P-Ranch. This work was aimed at stabilizing the streambanks and improving habitat for trout.

Three fish screens were installed at diversions off the Blitzen River to prevent trout from entering the irrigation system where they become trapped and die during dewatering. Screens were placed at both East and West Canals at Page Springs Dam, and also at the Long Barn Diversion near P-Ranch. These screens also serve to slow the invasion of carp from the river into the Blitzen Valley wetlands.

Marvin Jess & Oregon Department of Fish and Wildlife placing fish trap in fish ladder at Sodhouse Dam

12. Wildlife Propagation and Stocking

Rainbow trout were stocked in the Blitzen River and Krumbo Reservoir during the year. This effort was recommended and approved in the Fisheries Management Plan for the Blitzen River. The purpose of this stocking is to reduce fishing pressure on wild trout and to provide quality recreation experiences.

Krumbo Reservoir received 40,000 (70 per pound) fingerling rainbow trout in early May. In July, 5,000 catchable-sized rainbow trout were stocked in the Blitzen River system.

15. Animal Control

Predator Control to Enhance Greater Sandhill Crane Production

On 25 November 1985, the Service issued a final environmental assessment entitled Alternatives to Enhance the Production of Greater Sandhill Cranes on Malheur Refuge, Oregon. This assessment outlined a 21 percent decline in breeding pairs of sandhill cranes on Malheur Refuge from 236 in 1971 to 186 in 1985. The primary cause for this decline was low recruitment of young due to high nest predation by ravens, raccoons and coyotes, and high predation by coyotes on chicks before fledging. In an average year, predators destroyed 45 percent of all crane nests on the refuge and 85 percent of the chicks that hatched failed to fledged.

The assessment proposed that efforts to improve sandhill crane nesting habitat continue and that coyotes, ravens and raccoons would be controlled for three years (1986-1988). The purposes of the control efforts were to: 1) increase sandhill crane nesting success to 75 percent, fledging success to 25 percent, and annual recruitment to a minimum of 15 percent on a sustained basis, 2) reach refuge production objectives of 150 crane chicks annually, and 3) reverse the current downward trend in the refuge crane population so they could ultimately be removed from Region 1's Sensitive Species List.

Coyote control work began on 22 January 1988 when a single animal was shot from the ground by refuge personnel. The last coyote was removed on 11 August when it was trapped. During this period, a total of 226 coyotes were removed by all methods. Aerial gunning accounted for 56 percent of all coyotes taken. Trapping accounted for 27 percent of all coyotes taken and snares, one percent. Calling and shooting accounted for approximately ten percent of the coyotes taken. Also, three active dens were located during the 1988 season. These dens were gassed for a total estimated kill of 15 coyotes.

Five raccoons were taken between 24 March and 24 June 1988, all on the refuge; one via snare and five with leg-hold traps.

Five active raven nests were located on or near the refuge in 1988, in the predator control area. Ravens were removed from one of the sites with DRC-1339. Of the four active nests in the Blitzen Valley control area, two fledged young and nest fates of two were undetermined.

Between 4 March and 30 June, 105 dozen DRC-1339 bait eggs were placed in the predator control area. Most of the eggs (90 dozen) were placed in March and April. Since the local breeding population was known to be small, it is presumed that most of the ravens removed were either non-breeders or migrants that were passing through and hunting in the control areas. It is estimated that one raven was removed for each dozen eggs placed in the control area. Since one nesting pair was known to have been killed by bait eggs, the total DRC-1339 take was estimated to be two breeding adults and 100 non-breeding or migrant birds. An additional three ravens were shot, making the total estimated raven kill 105.

The objectives of the 1988 effort were to have a nesting success of 75%, fledging success of 25%, and recruitment of 15%. The actual outcome was 76% nest success; however, because of the crane's early migration, the other two factors could not be adequately determined. Based on these results, the 1988 season was judged a limited success.

16. Marking and Banding

Table XXIX summarizes birds banded under Malheur Refuge's permit this year. Due to banding quota cancellation, less effort went duck banding in 1988. Volunteer Rod Klus banded ducks in late July and August. We were asked by the Banding Laboratory to

participate in their reward banding study in late August. Volunteer Sandra Rule did most of the banding for that study.

Only one trumpeter swan cygnet was banded this year. The northern harrier was a rehabilitated bird, and the four peregrine falcons were banded by the Oregon Department of Fish and Wildlife. These birds were hacked at Summer Lake for their non-game program.

Table XXIX Summary of birds banded under Malheur Refuge permit #6270 during 1988.

SPECIES	SEX/AGE	NUMBER BANDED
Mallard	AHY-M	344
Mallard	AHY-F	360
Mallard	HY-M	55
Mallard	HY-F	42
MALLARD TOTAL	-----	801
Northern Pintail	-----	14
Green-winged Teal	-----	10
Gadwall	-----	3
Northern Shoveler	-----	1
Cinnamon Teal	-----	5
Trumpeter Swan	-----	1
Northern Harrier	-----	1
Peregrine Falcon	-----	4

17. Disease Prevention and Control

The only disease problem we encountered this year was when a waterfowl and waterbird disease die-off was discovered at Knox Pond, in the south end of the Blitzen Valley on Malheur Refuge during late July 1988. A large variety of birds were found dead during the outbreak, and 1354 birds were actually picked up. The outbreak apparently spread to Knox Swamp, another pond about 300 meter southeast in August. Losses continued through late August. We used airboats to pick up dead and sick birds during the outbreak. Knox Pond and Knox Swamp were drained during August to prevent further losses.

In the field, the outbreak appeared to be avian botulism. However, among a sample of ducks sent to the National Wildlife Health Laboratory at Madison, Wisconsin, some were diagnosed with botulism, while others were diagnosed with ERYSIPELAS, a disease caused by a bacterium of the genus Erysipelothrix. This bacterium is typically associated with fish and shellfish and has only rarely been documented in fish-eating birds (K. Converse, pers. comm.).

Until this year, the Knox Pond area has had no history of botulism. The area receives high quality water from snowpack on Steens Mountain, and is not as brackish as many typical botulism areas are.

Knox Pond contains approximately 300 acres and has been managed as a semi-permanent marsh in recent years. The pond was dewatered in February to destroy its carp population. At least 300 large carp were dead in the borrow pit area after the drawdown. These were partially consumed by ravens, bald eagles, coyotes, and other scavengers. The area was reflooded in March, after the fish had decomposed.

Apparently, the decomposed fish acted as the substrate for the bacterium, Erysipelothrix, and the bacterium persisted in the pond soils to infect ducks and other birds using the area. It is possible that carcasses of birds which died from an infection of erysipelas became infected with botulism as well, thus causing the botulism outbreak.

H. PUBLIC USE

1. General

Total refuge visits continued to increase following recent flooding that reduce vehicle access to the Blitzen Valley and the Double-O unit. Table XXX summarizes refuge visits by year.

Table XXX Estimated visits to Malheur Refuge.

Year	Visits
1983	19,880*
1984	11,180*
1985	22,080
1986	24,600
1987	39,670
1988	36,000

*Flooding significantly reduced vehicle access for part of the spring and summer

The increase in visits from the early 1980s reflects the receding lake levels and the resurfacing and repair of Highway 205 from Burns to Frenchglen. There is now reasonably smooth, all-weather access to the refuge headquarters and the Blitzen Valley. Only 12% of Malheur's visitors participated in hunting and fishing activities on the refuge. Bird watching and other wildlife observation activities continue to be the main attraction.

6. Interpretive Exhibits/Demonstration

The headquarters museum continued to attract over 50% of the total refuge visitation. This museum contains nearly 200 mounted specimens of birds native to the basin. They are mounted in life-like poses and serve as an identification guide to beginning and expert birders alike. In a five month period from May 1 to September 30 the visitor register was signed by individuals, families, organized conservation groups, elderhostel tours, researchers, and wildlife watchers from 37 states, 4 provinces in Canada and 16 countries in Europe, Asia, Africa, and Australia.

7. Other Interpretive Programs

Refuge personnel again participated in the annual John Scharff Migratory Waterfowl Festival headquartered at Burns Union High School. Constantino, Ivey, Paullin, and Ehlers erected the refuge display at the Burns High School. A significant drop in attendance this year is linked to the fact that there have been few changes in activities, speakers and the Festival is not attracting as many new or repeat visitors.

The refuge and Malheur Field Station co-hosted the Tenth Annual Desert Conference, April 16-17. Constantino and Voss gave guided refuge tours and attended the workshops and evening sessions.

Refuge staff presented interpretive and refuge management programs to a broad cross section of visitors including local scouts, elementary and high school students, elder hostel groups, Malheur Field Station students, and 5 college level wildlife and range classes.

8. Hunting

The Malheur Lake waterfowl hunting area received less than 50 visits this year. Emergent habitat has largely been flooded out within the refuge hunting area boundaries and the birds have moved to the shoreline that is now located on private land.

Chukar populations expanded moderately due to the dry spring and summer. Throughout the entire season, the increased bird numbers attracted 150 hunters to the rimrock habitat west of State Highway 205 in the Blitzen Valley.

The area between Diamond Lane and Sodhouse Lane was opened to upland game hunting November 20-30. A total of 150 hunters expended 400 hours and bagged 50 pheasant and 20 quail. Approximately 80 hunters showed up opening morning. The refuge is the only large parcel of public land open to public pheasant hunting in the county.

9. Fishing

Krumbo Reservoir, Blitzen River, and East and West Canals continued to provide adequate fishing for an estimated 2140 anglers this year. A few large-mouth bass and white crappie were checked during creel censuses. However, the bulk of the creel was rainbow trout in the 18-22 inch class. Fishing was best in May and again in October. Over 180 anglers fished Krumbo reservoir on opening weekend. They averaged just over one trout apiece. Fly fishing in float tubes and boating with electric motors are popular and effective methods of catching large trout! Many favorable comments were received about allowing electric motors while continuing to prohibit gas powered motors.

The revised hunting and fishing leaflet was distributed at headquarters and in leaflet boxes throughout the refuge.

10. Trapping

Beaver and muskrat were trapped this winter in an effort to reduce damage to dikes and roads. The program ran from November 21, 1988 through March 15, 1989. Two trappers were issued trapping permits. Danny Morris of Burns and his trapping partner Harvey Madarieta trapped the Double-O and the Blitzen Valley Unit from Sodhouse to Diamond Lane. Dale Rushton of Diamond trapped from Diamond Lane south to P-Ranch. A total of 18 beaver were taken: 14 from the Blitzen Valley and 4 from Double-O. One hundred eighteen muskrat were taken: 83 from the Blitzen Valley and 35 from Double-O.

11. Wildlife Observation

A very high percentage of Malheur's visitors engage in this activity. Wildlife observation via car was the most popular mode, followed by walking and birding among the trees at refuge headquarters, P-Ranch, Buena Vista and Benson Pond. The grain fields at East Grain Camp, Krumbo Valley, and West Knox Pond were popular viewing areas for sandhill cranes, Canada geese, and mule deer during the entire spring and again in late fall.

17. Law Enforcement

The project leader and primary assistant manager have law enforcement authority. The annual refresher course was held in Sacramento, California utilizing the facilities of the California Highway Patrol Academy. The second firearm's qualification was held near Burns with local Oregon State Police Range Officer Tim Cundell in charge.

Assistant Refuge Manager Voss attended archaeological resource and a law enforcement refresher course in Seattle conducted by the National Park Service. Topics discussed were: rules of evidence, state and federal regulations, archaeologist-officer-land manager cooperation, non-law enforcement employee authority, and local areas of concern.

Deer poaching in closed areas during state hunting season and "arrow-head" hunting year round continue to be the major law enforcement problem. An estimated 10 deer were taken illegally at the Double-O, P-Ranch and Diamond Lane areas. No one was stationed at the Double-O this year so it was extremely difficult to efficiently patrol the area. A local rancher did contact us several times about potential violators. But the hour and a half drive from refuge headquarters to the Double-O precluded any cases from being made.

Surface arrowhead collecting continues to be a popular springtime activity for local residents. As the word got out just how good the collecting was, "rock hounds" from Washington State, Idaho, and western Oregon came every weekend during the late spring. As the lake levels recede and refuge lands finally become exposed, we will have to coordinate a major enforcement effort to control these illegal activities.

Besides archaeological resource loss this spring, 835 pelicans were also lost when a colony abandoned their nesting efforts after artifact hunters tresspassed onto the closed island by boat. Subsequent investigation identified a suspect but not enough evidence could be collected to prosecute.

The following convictions were initiated by State and Federal offices on the refuge this year:

Hunt closed area.....	2	
Trapping violation.....	1	
Take big game deer in closed area...	1	
Camping in closed area.....	1	(Warning)
Chumming while fishing.....	1	
Fishing without license.....	5	

Oregon State Police worked the refuge during state deer, trout, and bobcat seasons. Their help and dedication was crucial to a successful enforcement effort.

I. EQUIPMENT AND FACILITIES

1. New Construction

Most work this year was directed towards rehabilitation and maintenance. However, three new construction projects were completed relating to fish passage and fish screening. Three self-cleaning fish screen were placed in cooperation with the Oregon Department of Fish and Wildlife at the Long Barn Diversion and in the East and West Canals below Page Springs Dam. These structures should keep trout from being flushed into the meadows during irrigation season and prevent carp from traveling upstream for a 3- to 5-year period during dry and average precipitation years.

Aerial view of Red-band trout/carp fish screens at West Canal below Page Springs Dam

Wood frame for Red-band trout/carp fish screens at West Canal below Page Springs Dam

Concrete pouring for Red-band trout/carp fish screens at West Canal below Page Springs Dam

Finished cement for Red-band trout/carp fish screens at West Canal below Page Springs Dam

2. Rehabilitation

A complete rehabilitation project list is given in **Table XXXI.**

3. Major Maintenance

In 1988 our maintenance staff concentrated on road repair, canal and ditch cleaning, and heavy equipment repair. The military dragline, 2950 John Deere farm tractor, Galleon roadgrader, and Ford backhoe required repair after breaking down in the field. Irrigation, fence maintenance, counting cattle and weighing hay bales continues to occupy the major portion of the substation mechanics' time. The West Canal cleaning project from Five Mile Road to Witzel Pond was completed and the Golden Canal at the Double-O was cleaned. A complete maintenance project list is given in **Table XXXI.**

Table XXXI Rehabilitation projects listed by field number.

BU	FIELD NAME	WORK DESCRIPTION	START DT
All	CPR	Blade CPR spray	Apr 1
All	Special Use Permits	Monitor for compliance	Apr 1
All	Water Management Plan	Water Control @ WMP	Apr 1
All	Water Control	Place 3 catwalks on WCS	Jun 15
All	Concrete Dams	Install 2 non-slip walk-ways	Aug 1
All	CPR	Blade CPR mow	Sep 15
1	Martha Lk Fld	Clean golden canal	Aug 1
5	Fish Passage	Place fishwy brds/river dams	Mar 1
5	HQ	Rpr office/Bio fct/tlt leaks	Mar 15
5	HQ	Repair public water fountain	Mar 15
5	Banding Pads	Place gravel banding pads	Aug 1
5	HQ	Rehab visitor signs/cln 1xwk	Mar 15
5	HQ	Install above ground gas tank	Apr 15
7	NW Big Sage Field	Place Carp Barrier	Mar 15
7	Rockford Ln Field	Repair slough washout	Sep 15
7	W. Wright Field	Repair Dunn Dam	Mar 1
8	Fish Passage	Place fshwy brds/river dams	Mar 1
8	BV Substation	Install above grnd gas tank	Apr 15
8	Banding Pads	Place gravel banding pads	Aug 1
8	W BV Pond	Grade/gravel main road	Mar 15
9	Oliver Spr Field	Rehab BLM water gap	Aug 1
10	Fish Passage	Place fshwy brds/river dams	Mar 1
10	E Krumbo Swamp Fld	FBR at equip crossing pipe	Sep 15
11	Banding Pads	Place gravel banding pads	Aug 1
11	Benson Pond	Repair washout E side	Oct 1
11	W Swamp # 1 Fld	Repair river dike	Oct 1
11	W Swamp # 1 Fld	Repair E-W dike	Oct 1
12	Fish Passage	Place fshwy brds/river dams	Mar 1
12	Fisheries Enhanc	Place Rk/Juniper rip-rap 3 fishscreens	May 15
12	Banding Pads	Place gravel banding pads	Aug 1
12	East Canal	Repair rubble structures x2	Sep 15
12	S Meadow Field	Place rock check or piling structure W Canal	Oct 1
12	Cowpie Pond	Place riprap	Oct 1
12	W Knox Field	Clean E&N&SE ditch	Oct 1
12	Rail Pond	Rip rap WC below Br. Creek	Sep 15
12	Bridge Cr Pond	Place rock riprap	Sep 15
12	Bridge Cr Field	Repair E boundary fence	Aug 1
12	Bridge Cr Field	Repair spreader dikes x1	Oct 1
12	Bridge Cr Field	Repair/clean ditch 150'	Oct 1
12	U Bridge Cr Field	Fence riparian Cr. Bottom	Jun 1
12	Barley Field	Rock E Canal Rd turnout	Mar 1
12	Big Deer Crk Field	Blade fishing acess rd x2	Mar 1
12	Big Deer Crk Field	Fence Page Spring Dam Access	Mar 1
12	Big Deer Crk Field	Place Fishscreen x 3	Oct 1

4. Equipment Utilization and Replacement

The refuge picked up a 4x2 Ford Courier pickup (37,000mi) and a 4x2 Dodge D150 pickup (43,000mi) on surplus from the Hanford Atomic Energy Commission site at Pasco, Washington. We will use these vehicle to provide transportation for seasonal volunteers and biological technicians.

We received a surplus 1970 IHC 4x4, 3-way, 3-yard dump truck from Nisqually National Wildlife Refuge for hauling on narrow dike tops in the Blitzen Valley.

The refuge purchased a Champion 720A road grader and ripper for $78,516.

5. Communications Systems

A third phone line and auto open-line search function was installed in August to provide the public with better service and the staff with more ability to reach other parties.

6. Computer Systems

An additional work station was acquired for use by the administrative staff for word processing and budget tracking. The new work station included an ITT Model 400 80286 desk top computer with 640k RAM, 40mb harddrive, a 1.2mb and 360k 5 1/4" floppy disk drives, color monitor, and EPSON 1050 dot matrix printer. With this purchase, the refuge now has two completely compatible work stations running the same word processing (Word Perfect 4.2 and 5.0), Lotus 123 spread-sheet, and database (R-Base) management software. Plans are to purchase another complete workstation in fiscal year 1989 for use by the habitat staff.

7. Energy Conservation

Thermal pane windows were installed in quarters #9 at headquarters.

J. OTHER ITEMS

1. Cooperative Programs

The U.S. Geological Survey continued to monitor Malheur Lake water levels with a continuous-recording gauge. However, the guage is no longer in the main body of the lake. As the flood waters receded, the area where the guage is located became an isolated pond. Therefore, guage readings are not accurate. The Geological Survey moved the manual guage station from the pond to the river channel near the old Benson boat landing.

Weather data were recorded at all 4 stations on the refuge. Evaporation rates were recorded only at headquarters.

The Soil Conservation Service continued to conduct monthly snow surveys during the winter. Irrigation plans were based on these surveys, which record water content in snow packs surrounding the Harney Basin.

2. Items of Interest

The 1988 grazing fee survey was completed after five years of effort, three surveys, a grazing fee review committee, a congressman, and two regional directors! The standard grazing rate is $4.00 per AUM. The standard haying rate is $10.00 per ton. There is an "idle field" discount of 20% on the 1st year of haying after a period of no treatment and a discount of 10% on the 2nd year of haying after a period of no treatment. There is a "problem vegetation discount" of 0%-40% depending on the percentage of noxious weeds present or if the field has no forage value. There is "hay date discount" of $1-$10 per ton depending on the lateness of the date the permittee is allowed to cut hay. The refuge does not collect $200 when it passes "Go", and must land on Boardwalk and pay double every time around the table.

4. Credits

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